

Service
Service
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Service Manual

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1. Technical Specifications, Connections, and Chassis Overview

Index of this chapter:

- 1.1 Technical Specifications
- 1.2 Connections
- 1.3 Chassis Overview

Notes:

- Figures can deviate due to the different set executions.
- Specifications are indicative (subject to change).

1.1 Technical Specifications

1.1.1 Vision

Display type	: CRT, DV, RF
Screen size	: 27", 4:3
Tuning system	: PLL
TV Color systems	: ATSC (QAM, 8VSB)
	: NTSC
IF picture carrier	: 45.75 MHz
Video playback	: NTSC

1.1.2 Sound

Sound systems	: BTSC
Maximum power (W_{RMS})	: 2 x 10

1.1.3 Miscellaneous

Power supply:	
- Mains voltage (V_{AC})	: 90 - 140
- Mains frequency (Hz)	: 60
Ambient conditions:	
- Temperature range ($^{\circ}C$)	: +5 to +40
- Maximum humidity	: 90% R.H.

Power consumption (values are indicative)	
- Normal operation (W)	: ≈ 120
- Stand-by (W)	: < 1

1.1.4 Mechanical Styling

Model Number	Styling Name
27HT4000D/27	SL3
27HT7210D/27	SL5

In above table the link is shown between the model number and the (internal) Philips styling number. In this manual, sometimes a reference is made to this styling number. For a mechanical drawing of the model, please check the quarterly published Product Survey.

1.2 Connections

Note: The following connector color abbreviations are used (acc. to DIN/IEC 757): Bk= Black, Bu= Blue, Gn= Green, Gy= Grey, Rd= Red, Wh= White, Ye= Yellow.

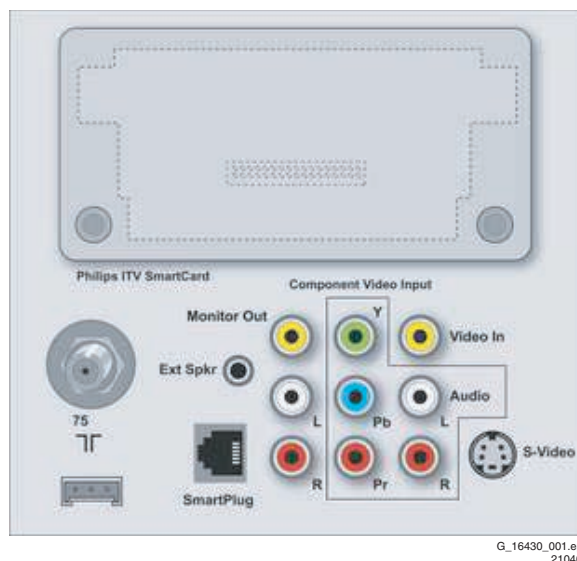


Figure 1-1 Connections overview (27HT7210D/27, see also DFU)

1.2.1 Rear Connections

Cinch: S/PDIF - Out

Bk - Coaxial	0.4 - 0.6V _{PP} / 75 ohm	⊖⊕
--------------	-----------------------------------	----

Cable/Antenna - In

- F-type (US)	Coax, 75 ohm	⊥
---------------	--------------	---

Service Connector (ComPair)

1 - SDA-S	I ² C Data (0 - 5 V)	⊖⊕
2 - SCL-S	I ² C Clock (0 - 5 V)	⊖⊕
3 - Ground	Gnd	⊥

Mini Jack: Ext. Bathroom speaker- Out

- External speaker
- stereo jack, pins 1-3

RJ11: Smartplug™

- 1 - CLOCK
- 2 - DATA IN
- 3 - + 5 V
- 4 - DATA OUT
- 5 - GND
- 6 - IR DATA

Monitor Out - Cinch: Video CVBS - Out, Audio - Out

Ye - Video CVBS	1 V _{PP} / 75 ohm	⊖⊕
Wh - Audio L	0.5 V _{RMS} / 10 kohm	⊖⊕
Rd - Audio R	0.5 V _{RMS} / 10 kohm	⊖⊕

AV1 - Cinch: Video YPbPr - In

Gn - Video Y	1 V _{PP} / 75 ohm	⊖⊕
Bu - Video Pb	0.7 V _{PP} / 75 ohm	⊖⊕
Rd - Video Pr	0.7 V _{PP} / 75 ohm	⊖⊕

AV1 - Cinch: Video CVBS - In, Audio - In

Ye - Video CVBS	1 V _{PP} / 75 ohm	⊖⊕
Wh - Audio L	0.5 V _{RMS} / 10 kohm	⊖⊕

Rd - Audio R 0.5 V_{RMS} / 10 kohm



3 - Video Y

1 V_{PP} / 75 ohm



4 - Video C

0.3 V_{PP} / 75 ohm



AV2 - Cinch: Video CVBS - In, Audio - In

Ye - Video CVBS 1 V_{PP} / 75 ohm

Wh - Audio L 0.5 V_{RMS} / 10 kohm

Rd - Audio R 0.5 V_{RMS} / 10 kohm



1.2.2 Side Connections

Cinch: Video CVBS - In, Audio - In

Ye - Video CVBS 1 V_{PP} / 75 ohm

Wh - Audio L 0.5 V_{RMS} / 10 kohm

Rd - Audio R 0.5 V_{RMS} / 10 kohm

Bk - Head phone 32 - 600 ohm / 10 mW



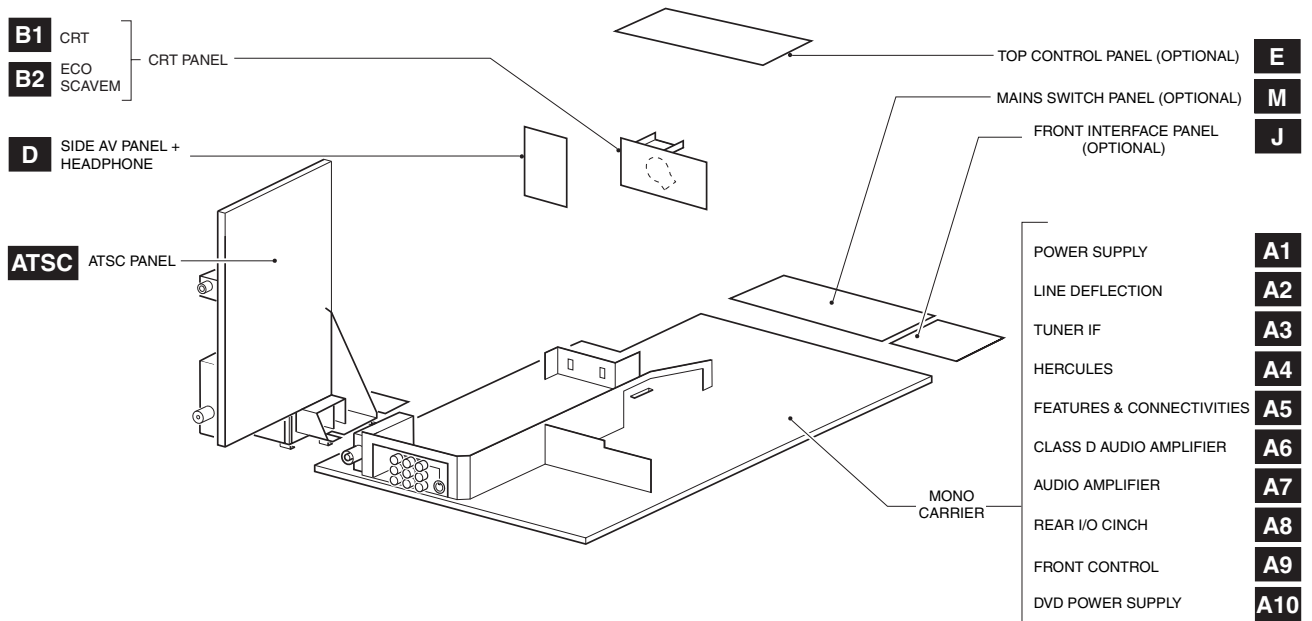
AV2 - SVHS (Hosiden): Video Y/C - In

1 - Ground Y Gnd

2 - Ground C Gnd



1.3 Chassis Overview



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Figure 1-2 PWB location

2. Safety Instructions, Warnings, and Notes

Index of this chapter:

- 2.1 Safety Instructions
- 2.2 Maintenance Instructions
- 2.3 Warnings
- 2.4 Notes

2.1 Safety Instructions

Safety regulations require that **during** a repair:

- Due to the chassis concept, a very large part of the circuitry (incl. deflection) is 'hot'. Therefore, connect the set to the mains via an isolation transformer.
- Replace safety components, indicated by the symbol ▲, only by components identical to the original ones. Any other component substitution (other than original type) may increase risk of fire or electrical shock hazard.
- Wear safety goggles when you replace the CRT.

Safety regulations require that **after** a repair, you must return the set in its original condition. Pay, in particular, attention to the following points:

- General repair instruction: as a strict precaution, we advise you to re-solder the solder connections through which the horizontal deflection current is flowing. In particular this is valid for the:
 1. Pins of the line output transformer (LOT).
 2. Fly-back capacitor(s).
 3. S-correction capacitor(s).
 4. Line output transistor.
 5. Pins of the connector with wires to the deflection coil.
 6. Other components through which the deflection current flows.

Note: This re-soldering is advised to prevent bad connections due to metal fatigue in solder connections, and is therefore only necessary for television sets more than two years old.

- Route the wire trees and EHT cable correctly and secure them with the mounted cable clamps.
- Check the insulation of the mains cord for external damage.
- Check the strain relief of the mains cord for proper function, to prevent the cord from touching the CRT, hot components, or heat sinks.
- Check the electrical DC resistance between the mains plug and the secondary side (only for sets that have an isolated power supply). Do this as follows:
 1. Unplug the mains cord and connect a wire between the two pins of the mains plug.
 2. Turn on the main power switch (keep the mains cord unplugged!).
 3. Measure the resistance value between the pins of the mains plug and the metal shielding of the tuner or the aerial connection of the set. The reading should be between 4.5 MΩ and 12 MΩ.
 4. Switch the TV 'off' and remove the wire between the two pins of the mains plug.
- Check the cabinet for defects, to prevent the possibility of the customer touching any internal parts.

2.2 Maintenance Instructions

We recommend a maintenance inspection carried out by qualified service personnel. The interval depends on the usage conditions:

- When a customer uses the set under normal circumstances, for example in a living room, the recommended interval is three to five years.
- When a customer uses the set in an environment with higher dust, grease, or moisture levels, for example in a kitchen, the recommended interval is one year.
- The maintenance inspection includes the following actions:

1. Perform the 'general repair instruction' noted above.
2. Clean the power supply and deflection circuitry on the chassis.
3. Clean the picture tube panel and the neck of the picture tube.

2.3 Warnings

- In order to prevent damage to ICs and transistors, avoid all high voltage flashovers. In order to prevent damage to the picture tube, use the method shown in Fig. 2-1, to discharge the picture tube. Use a high voltage probe and a multi-meter (position V_{dc}). Discharge until the meter reading is 0 V (after approx. 30 s).

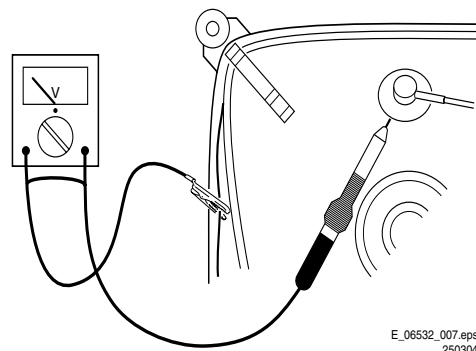


Figure 2-1 Discharge picture tube

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD, ▲). Careless handling during repair can reduce life drastically. Make sure that, during repair, you are connected with the same potential as the mass of the set by a wristband with resistance. Keep components and tools also at this potential. Available ESD protection equipment:
 - Complete kit ESD3 (small tablemat, wristband, connection box, extension cable and ground cable) 4822 310 10671.
 - Wristband tester 4822 344 13999.
- Together with the deflection unit and any multi-pole unit, flat square picture tubes form an integrated unit. The deflection and the multi-pole units are set optimally at the factory. We do not recommend adjusting this unit during repair.
- Be careful during measurements in the high voltage section and on the picture tube.
- Never replace modules or other components while the unit is 'on'.
- When you align the set, use plastic rather than metal tools. This will prevent any short circuits and the danger of a circuit becoming unstable.

2.4 Notes

2.4.1 General

- Measure the voltages and waveforms with regard to the chassis (= tuner) ground (⊥), or hot ground (⊥), depending on the tested area of circuitry.
- The voltages and waveforms shown in the diagrams are indicative. Measure them in the Service Default Mode (see chapter 5) with a color bar signal and stereo sound (L: 3 kHz, R: 1 kHz unless stated otherwise) and picture carrier at 475.25 MHz for PAL, or 61.25 MHz for NTSC (channel 3).

- Where necessary, measure the waveforms and voltages with (⏏) and without (⏏) aerial signal. Measure the voltages in the power supply section both in normal operation (ⓐ) and in standby (ⓑ). These values are indicated by means of the appropriate symbols.
- The picture tube panel has printed spark gaps. Each spark gap is connected between an electrode of the picture tube and the Aquadag coating.
- The semiconductors indicated in the circuit diagram and in the parts lists, are interchangeable per position with the semiconductors in the unit, irrespective of the type indication on these semiconductors.

2.4.2 Schematic Notes

- All resistor values are in ohms and the value multiplier is often used to indicate the decimal point location (e.g. 2K2 indicates 2.2 kohm).
- Resistor values with no multiplier may be indicated with either an "E" or an "R" (e.g. 220E or 220R indicates 220 ohm).
- All capacitor values are expressed in micro-farads ($\mu = \times 10^{-6}$), nano-farads ($n = \times 10^{-9}$), or pico-farads ($p = \times 10^{-12}$).
- Capacitor values may also use the value multiplier as the decimal point indication (e.g. 2p2 indicates 2.2 pF).
- An "asterisk" (*) indicates component usage varies. Refer to the diversity tables for the correct values.
- The correct component values are listed in the Electrical Replacement Parts List. Therefore, always check this list when there is any doubt.

2.4.3 Lead-free Solder

Philips CE is producing lead-free sets (PBF) from 1.1.2005 onwards.

Identification: The bottom line of a type plate gives a 14-digit serial number. Digits 5 and 6 refer to the production year, digits 7 and 8 refer to production week (in example below it is 1991 week 18).



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Figure 2-2 Serial number example

Regardless of the special lead-free logo (which is not always indicated), one must treat all sets from this date onwards according to the rules as described below.



Figure 2-3 Lead-free logo

Due to lead-free technology some rules have to be respected by the workshop during a repair:

- Use only lead-free soldering tin Philips SAC305 with order code 0622 149 00106. If lead-free solder paste is required, please contact the manufacturer of your soldering equipment. In general, use of solder paste within

workshops should be avoided because paste is not easy to store and to handle.

- Use only adequate solder tools applicable for lead-free soldering tin. The solder tool must be able:
 - To reach a solder-tip temperature of at least 400°C.
 - To stabilise the adjusted temperature at the solder-tip.
 - To exchange solder-tips for different applications.
- Adjust your solder tool so that a temperature of around 360°C - 380°C is reached and stabilised at the solder joint. Heating time of the solder-joint should not exceed ~ 4 sec. Avoid temperatures above 400°C, otherwise wear-out of tips will increase drastically and flux-fluid will be destroyed. To avoid wear-out of tips, switch "off" unused equipment or reduce heat.
- Mix of lead-free soldering tin/parts with leaded soldering tin/parts is possible but PHILIPS recommends strongly to **avoid** mixed regimes. If this cannot be avoided, carefully clear the solder-joint from old tin and re-solder with new tin.
- Use only original spare-parts listed in the Service-Manuals. Not listed standard material (commodities) has to be purchased at external companies.
- For sets produced before 1.1.2005, containing leaded soldering tin and components, all needed spare parts will be available till the end of the service period. For the repair of such sets nothing changes.

In case of doubt whether the board is lead-free or not (or with mixed technologies), you can use the following method:

- Always use the highest temperature to solder, when using SAC305 (see also instructions below).
- De-solder thoroughly (clean solder joints to avoid mix of two alloys).

2.4.4 Alternative BOM identification

In September 2003, Philips CE introduced a change in the way the serial number (or production number, see Figure 2-2) is composed. From this date on, the **third digit** in the serial number (example: AG2B0335000001) indicates the number of the alternative BOM (Bill of Materials used for producing the specific model of TV set). It is possible that the same TV model on the market is produced with e.g. two different types of displays, coming from two different O.E.M.s.

By looking at the third digit of the serial number, the service technician can see if there is more than one type of B.O.M. used in the production of the TV set he is working with. He can then consult the At Your Service Web site, where he can type in the Commercial Type Version Number of the TV set (e.g. 28PW9515/12), after which a screen will appear that gives information about the number of alternative B.O.M.s used. If the third digit of the serial number contains the number 1 (example: AG1B0335000001), then there is only one B.O.M. version of the TV set on the market. If the third digit is a 2 (example: AG2B0335000001), then there are two different B.O.M.s. **Information about this is important for ordering the correct spare parts!**

For the third digit, the numbers 1...9 and the characters A...Z can be used, so in total: 9 plus 26 = 35 different B.O.M.s can be indicated by the third digit of the serial number.

2.4.5 Practical Service Precautions

- **It makes sense to avoid exposure to electrical shock.** While some sources are expected to have a possible dangerous impact, others of quite high potential are of limited current and are sometimes held in less regard.
- **Always respect voltages.** While some may not be dangerous in themselves, they can cause unexpected reactions that are best avoided. Before reaching into a powered TV set, it is best to test the high voltage insulation. It is easy to do, and is a good service precaution.

3. Directions for Use

You can download this information from the following websites:

<http://www.philips.com/support>

<http://www.p4c.philips.com>

4. Mechanical Instructions

Index of this chapter:

- 4.1 Set Disassembly
- 4.2 Service Position
- 4.3 Assy/Panel Removal
- 4.4 Set Re-assembly

Notes:

- Figures below can deviate slightly from the actual situation, due to different set executions.

4.1 Set Disassembly

Warning: Be sure to disconnect the AC power from the set before opening it.

4.1.1 Rear Cover

1. Remove all fixation screws of the rear cover (do not forget the screws that hold the rear connection panel, and the screws on the small black cover with the text "not to be removed").
2. Pull the rear cover backwards to remove it.

4.2 Service Position

Before placing the Mono Carrier in its service position, remove the Front Interface assy/panel (see paragraph "Front Interface Assy/Panel removal") and the Side AV assy/panel (see paragraph "Side AV Assy/Panel removal").

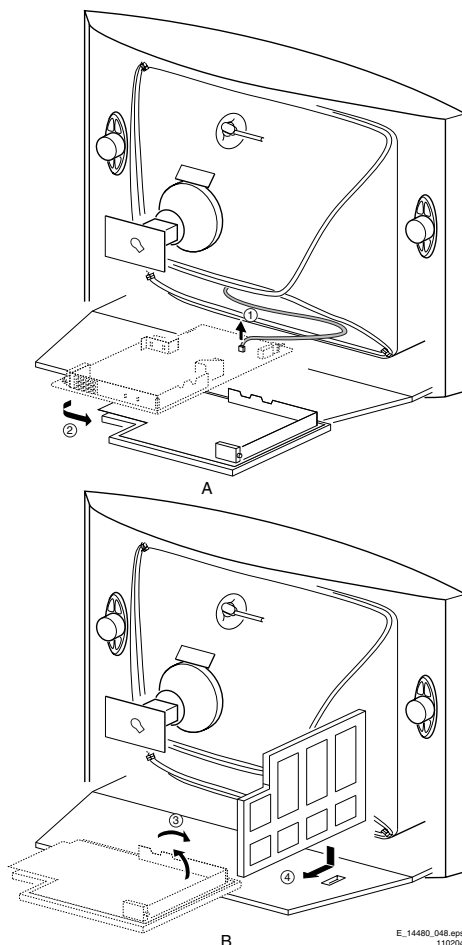


Figure 4-1 Service position Mono Carrier

1. Disconnect the degaussing coil [1].
2. Release the two fixation clamps (at the mid left and mid right side of the bracket), and remove the bracket from the bottom tray, by pulling it backwards [2].
3. Turn the chassis tray 90 degrees counter clockwise.
4. Move the panel bracket somewhat to the left and flip it 90 degrees [3], with the components towards the CRT.
5. Turn the panel bracket with the rear I/O toward the CRT.
6. Place the hook of the tray in the fixation hole of the cabinet bottom [4] and secure it.

4.3 Assy/Panel Removal

4.3.1 Front Interface Assy/Panel Removal

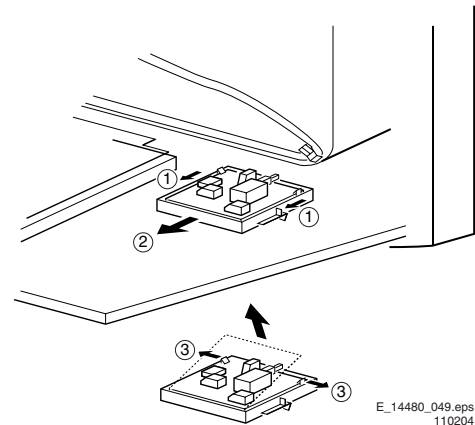


Figure 4-2 Front interface assy/panel removal

1. Remove the complete module from the bottom plate, by pulling the two fixation clamps upward [1], while sliding the module away from the CRT [2].
Note: these clamps are difficult to access.
2. Release the two fixation clamps [3] at the side of the bracket, and lift the panel out of the bracket (it hinges at one side).

4.3.2 Side AV Assy/Panel Removal

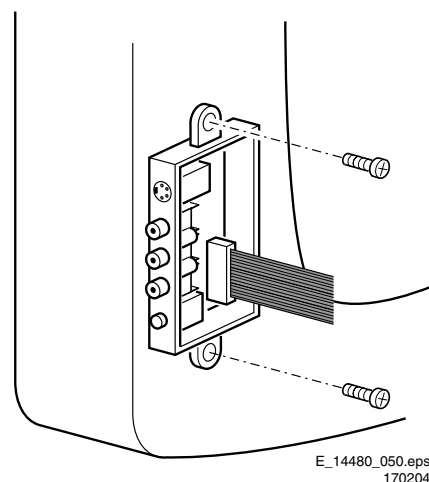


Figure 4-3 Side AV assy/panel removal

1. Remove the two fixation screws, and remove the complete Side AV assembly.
2. Release the two fixation clamps, and lift the panel out of the bracket.

4.3.3 ATSC Module/Panel Removal

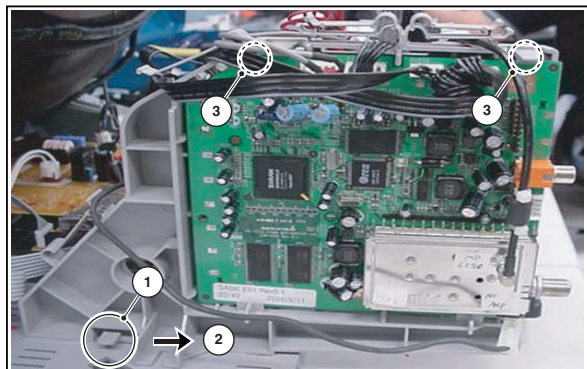
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Figure 4-4 ATSC bracket

1. Disconnect all cables that lead to the module.
2. Unlock the clip [1] at the left side of the bracket and pull out the ATSC module [2].
3. Release the fixation clips that hold the panel [3] and take out the panel (it hinges at the bottom).

4.3.4 EPS1B Module/Panel Removal

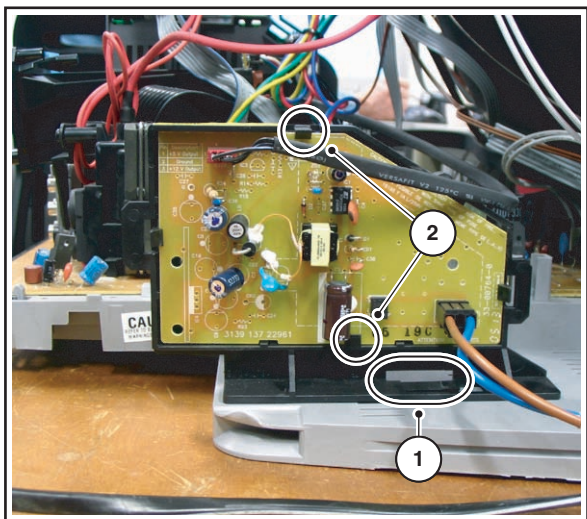
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Figure 4-5 EPS1B Module

1. Disconnect all cables that lead to the module.
2. Unlock the clip [1] at the lower side of the bracket and pull out the EPS1B bracket.
3. Release the fixation clips that hold the panel [2] and take out the panel.

4.3.5 Interface Module/Panel Removal

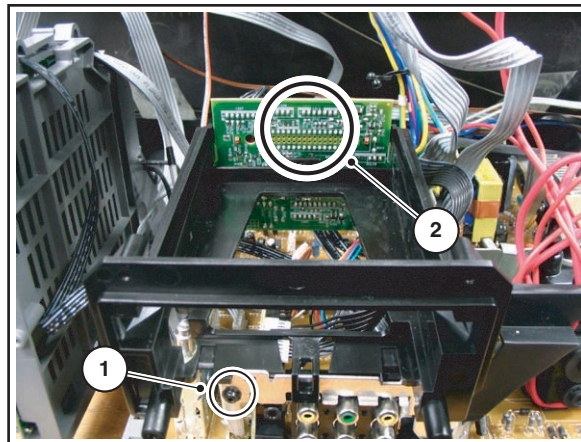
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Figure 4-6 Bracket with Interface Module

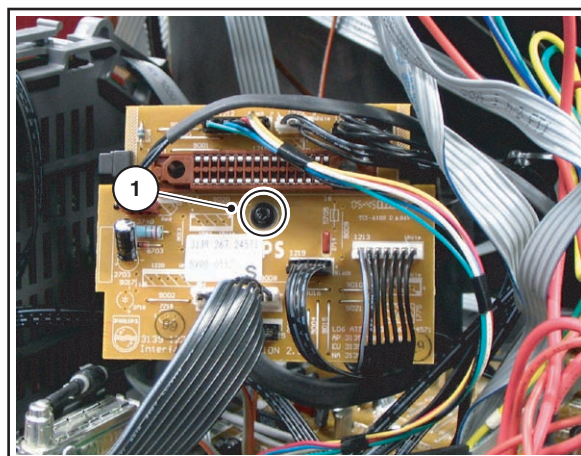
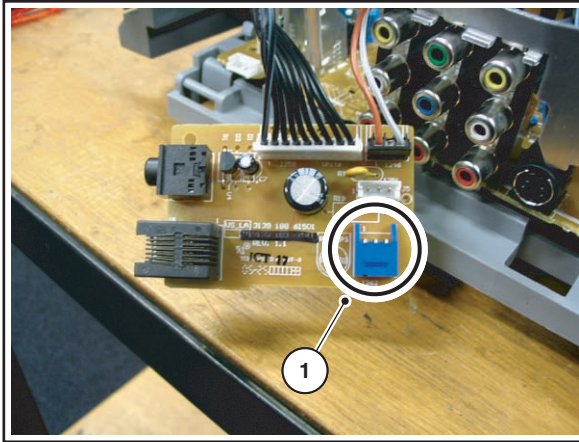
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Figure 4-7 Interface Module

1. Loosen the screw [1] that fixes the bracket with the Interface module [2] to the TV chassis, and reverse the bracket to get access to the Interface Module (see Figure "Bracket with Interface Module").
2. Loosen the screw [1] in the middle of the Interface Module, release the fixation clips (or shift the Interface Module aside), and take it out of its bracket (see Figure "Interface Module").
3. Disconnect all cables that lead to the Interface Module.

4.3.6 SP/LS Module/Panel Removal



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Figure 4-8 SP/LS Module

1. Loosen the screw [1] that fixes the bracket with the Interface module to the TV chassis, and position the bracket in such a way that it no longer blocks access to the SP/LS module (see Figure "Bracket with Interface Module").
2. Unlock the connector [1] that fixes the SP/LS module to the chassis, and take out the SP/LS module (see Figure "SP/LS Module").
3. Disconnect all cables that lead to the module.

4.4 Set Re-assembly

To re-assemble the whole set, do all processes in reverse order.

Note: before you mount the rear cover, perform the following checks:

- Check whether the AC power cord is mounted correctly in its guiding brackets.
- Check whether all cables are replaced in their original position

5. Service Modes, Error Codes, and Fault Finding

- Index of this chapter:
- 5.1 Test Points
 - 5.2 Service Modes
 - 5.3 ComPair
 - 5.4 Error Codes
 - 5.5 The Blinking LED Procedure
 - 5.6 Protections
 - 5.7 Fault Finding and Repair Tips

5.1 Test Points

This chassis is equipped with test points in the service printing. In the schematics test points are identified with a rectangle box around Fxxx or lxxx. These test points are specifically mentioned in the “Test Point Overview” as “half moons” with a dot in the center.

- Perform measurements under the following conditions:
- Television set in Service Default Alignment Mode.
 - Video input: Color bar signal.
 - Audio input: 3 kHz left channel, 1 kHz right channel.

5.2 Service Modes

Service Default Alignment Mode (SDAM) offers several features for the service technician, while the Customer Service Mode (CSM) is used for communication between the call center and the customer. For the TV setup main menu, please refer to the DFU.

This chassis also offers the option of using ComPair, a hardware interface between a computer and the TV chassis. It offers the abilities of structured troubleshooting, error code reading, and software version readout for all chassis. *Minimum requirements for ComPair:* a Pentium processor, a Windows OS, and a CD-ROM drive (see also paragraph "ComPair").

5.2.1 Service Default Alignment Mode (SDAM)

Purpose

- To change option settings.
- To create a predefined setting to get the same measurement results as given in this manual.
- To display / clear the error code buffer when leaving SDAM with “standby” key on remote control.
- To override SW protections.
- To perform alignments.
- To start the blinking LED procedure.

Specifications

- Tuning frequency:
 - 61.25 MHz (channel 3)
- Colour system:
 - NTSC
- All picture settings at 50 % (brightness, color contrast, hue).
- Bass, treble and balance at 50 %; volume at 25 %.
- All service-unfriendly modes (if present) are disabled, like:
 - (sleep) timer,
 - child/parental lock,
 - blue mute,
 - hotel/hospitality mode
 - auto switch-off (when no IDENT video signal is received for 15 minutes),
 - skip / blank of non-favourite presets / channels,
 - auto store of personal presets,
 - auto user menu time-out.
- Operation hours counter.

- Software version.
- Option settings.
- Error buffer reading and erasing.
- Software alignments.

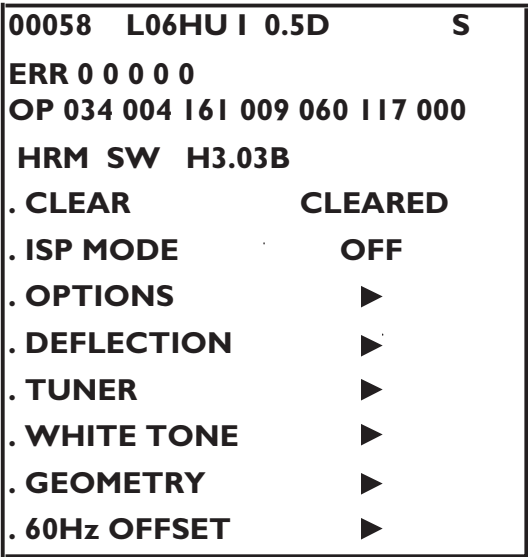
How to Enter SDAM

To enter SDAM, use one of the following methods:

- Switch the optional RC2573GR remote controll to Setup mode, and press the following key sequence on the remote control transmitter: “062596” directly followed by the M(enu) button (do not allow the display to time out between entries while keying the sequence).
- Or via ComPair.
- Or Short circuit the SDAM jumper on the mono carrier (see Chapter 7: Layout Mono Carrier: Top side, item 9252 in cel C5) and apply AC power. Then press the power button (remove the short circuit after start-up).

Caution: Entering SDAM by short-circuiting the SDAM jumper will override the +8V-protection. Do this only for a short period. When doing this, the service-technician must know exactly what he is doing, as it could lead to damaging the set.

After entering SDAM, the following screen is visible, with “S” in the upper right corner of the screen to indicate that the television is in Service Default Alignment Mode.



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Figure 5-1 SAM menu (example)

- LLLL**
This is the operation hours counter. It counts the normal operation hours, not the standby hours.
- AAAABC-X.Y**
This is the software identification of the main micro controller:
 - A = the project name (L04H).
 - B = the region: E= Europe, A= Asia Pacific, U= NAFTA, L= LATAM.
 - C = the feature and language
 - X = the main software version number.
 - Y = the sub software version number.
- S**
Indication of the actual mode. S= SDAM= Service Default Alignment mode.
- Error buffer**
Five errors possible.

5. **Option bytes**
Shows the actual settings of the options; seven codes possible.
6. **Clear**
Erases the contents of the error buffer. Select the CLEAR menu item and press the MENU RIGHT key. The content of the error buffer is cleared
7. **ISP Mode**
Can be used to switch on the television to ISP mode (for uploading software)
8. **Options**
To set the Option Bytes. See chapter 8 for a detailed description.
9. **Deflection**
To align the Deflection. See chapter 8 for a detailed description.
10. **Tuner**
To align the Tuner. See chapter 8 for a detailed description.
11. **White Tone**
To align the White Tone. See chapter 8 for a detailed description.
12. **Geometry**
To align the Geometry. See chapter 8 for a detailed description.
13. **60Hz offset**
To align the horizontal and vertical screen positions and vertical amplitude at 60 Hz. See chapter 8 for a detailed description.

How to Navigate

Use one of the following methods:

- In SDAM, select menu items with the CURSOR UP/DOWN key on the remote control transmitter. The selected item will be highlighted. When not all menu items fit on the screen, move the CURSOR UP/DOWN key to display the next / previous menu items.
- With the CURSOR LEFT/RIGHT keys, it is possible to:
 - Activate the selected menu item.
 - Change the value of the selected menu item.
 - Activate the selected submenu.
- When you press the MENU key in a submenu, you will return to the previous menu.

How to Store Settings

To store settings first go back to the main menu (fig. 5-1) with "MENU" button on the remote control and leave the SDAM with the "STANDBY" button on the remote control.

How to Exit

Switch the set to STANDBY by pressing the power button on the remote control transmitter. The error buffer is cleared. (If you switch the set 'off' by removing the AC power, the set will return in SDAM when AC power is re-applied and the error buffer will not be cleared.)

5.2.2 Customer Service Mode (CSM)

Purpose

The Customer Service Mode shows error codes and information on the TV's operation settings. The call center can instruct the customer (by telephone) to enter CSM in order to identify the status of the set. This helps the call center to diagnose problems and failures in the TV set before making a service call.

The CSM is a read-only mode; therefore, modifications are not possible in this mode.

How to Enter

To enter CSM, switch the optional RC2573GR remote control to Setup mode, and press its RECALL button.

Upon entering the Customer Service Mode, the following screen will appear:

1	00058	L06HU	0.5D	CSM
2	CODES	0	0	0
3	CODES	0	0	0
4	OP	034	004	161
5	AUTO	AUTO	STEREO	
6				
7				
8	CO	31	CL	31
9	VL	13	BL	0
10	BS	31	TR	31
11	COMMERCIAL	SMARTPORT	OFF	
12	CHANNEL	TV2		

G_16430_009.eps
210406

Figure 5-2 CSM menu (example)

Menu Explanation

1. Indication of the operation hours counter, the chassis firmware version, and the service mode (CSM= Customer Service Mode).
2. Displays the software version used.
3. Displays the last five errors detected in the error code buffer.
4. Displays the option bytes (decimal values).
5. Displays sound info of the set.
6. Indicates if the television is receiving an "IDENT" signal on the selected source. If no "IDENT" signal is detected, the display will read "NOT TUNED"
7. Reserved.
8. Displays various picture settings.
9. Displays various picture settings.
10. Displays various picture settings.
11. Displays if the TV set is in CONSUMER or COMMERCIAL mode, and if it is on-line with e.g. a SmartPort DCM.
12. Displays the sound setting information.

How to Exit

To exit CSM, use one of the following methods:

- Press the MENU, STATUS/EXIT, or POWER button on the remote control transmitter.
- Press the POWER button on the television set.

5.3 ComPair

5.3.1 Introduction

ComPair (Computer Aided Repair) is a service tool for Philips Consumer Electronics products. ComPair is a further development on the European DST (service remote control), which allows faster and more accurate diagnostics. ComPair has three big advantages:

- ComPair helps you to quickly get an understanding on how to repair the chassis in a short time by guiding you systematically through the repair procedures.
- ComPair allows very detailed diagnostics (on I²C level) and is therefore capable of accurately indicating problem areas. You do not have to know anything about I²C commands yourself because ComPair takes care of this.
- ComPair speeds up the repair time since it can automatically communicate with the chassis (when the microprocessor is working) and all repair information is directly available. When ComPair is installed together with

the Force/SearchMan electronic manual of the defective chassis, schematics and PWBs are only a mouse click away.

5.3.2 Specifications

ComPair consists of a Windows based fault finding program and an interface box between PC and the (defective) product. The ComPair interface box is connected to the PC via a serial (or RS-232) cable.

For this chassis, the ComPair interface box and the TV communicate via a bi-directional service cable via the service connector(s).

The ComPair fault finding program is able to determine the problem of the defective television. ComPair can gather diagnostic information in two ways:

- Automatically (by communicating with the television): ComPair can automatically read out the contents of the entire error buffer. Diagnosis is done on I²C/UART level. ComPair can access the I²C/UART bus of the television. ComPair can send and receive I²C/UART commands to the microcontroller of the television. In this way, it is possible for ComPair to communicate (read and write) to devices on the I²C/UART buses of the TV-set.
- Manually (by asking questions to you): Automatic diagnosis is only possible if the microcontroller of the television is working correctly and only to a certain extent. When this is not the case, ComPair will guide you through the fault finding tree by asking you questions (e.g. *Does the screen give a picture? Click on the correct answer: YES / NO*) and showing you examples (e.g. *Measure test-point 17 and click on the correct oscilloscope you see on the oscilloscope*). You can answer by clicking on a link (e.g. text or a waveform picture) that will bring you to the next step in the fault finding process.

By a combination of automatic diagnostics and an interactive question / answer procedure, ComPair will enable you to find most problems in a fast and effective way.

5.3.3 How to Connect

This is described in the chassis fault finding database in ComPair.

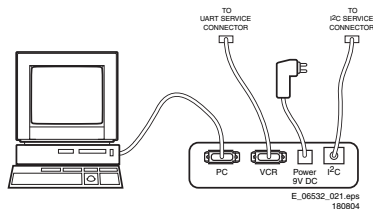


Figure 5-3 ComPair interface connection

5.3.4 How to Order

ComPair order codes (US):

- ComPair Software: ST4191.
- ComPair Interface Box: 4822 727 21631.
- AC Adapter: T405-ND.
- ComPair Quick Start Guide: ST4190.
- ComPair interface extension cable: 3139 131 03791.
- ComPair UART interface cable: 3122 785 90630.

Note: If you encounter any problems, contact your local support desk.

5.4 Error Codes

The error code buffer contains all errors detected since the last time the buffer was erased. The buffer is written from left to right. When an error occurs that is not yet in the error code buffer, it is displayed at the left side and all other errors shift one position to the right.

5.4.1 How To Read The Error Buffer

You can read the error buffer in 3 ways:

- On screen via the SAM (if you have a picture). **Examples:**
 - ERROR: 0 0 0 0 0: No errors detected
 - ERROR: 6 0 0 0 0: Error code 6 is the last and only detected error
 - ERROR: 9 6 0 0 0: Error code 6 was detected first and error code 9 is the last detected (newest) error
- Via the blinking LED procedure (when you have no picture). See "The Blinking LED Procedure".
- Via ComPair.

5.4.2 How to Clear the Error Buffer

The error code buffer is cleared in the following cases:

- By using the CLEAR command in the SAM menu:
 - To enter SAM, press the following key sequence on the remote control transmitter: "062596" directly followed by the OSD/STATUS button (do not allow the display to time out between entries while keying the sequence).
 - Make sure the menu item CLEAR is highlighted. Use the MENU UP/DOWN buttons, if necessary.
 - Press the MENU RIGHT button to clear the error buffer. The text on the right side of the "CLEAR" line will change from "CLEAR?" to "CLEARED"
- If the contents of the error buffer have not changed for 50 hours, the error buffer resets automatically.

Note: If you exit SAM by disconnecting the AC power from the television set, the error buffer is not reset.

5.4.3 Error Codes

In case of non-intermittent faults, write down the errors present in the error buffer and clear the error buffer before you begin the repair. This ensures that old error codes are no longer present.

If possible, check the entire contents of the error buffer. In some situations, an error code is only the result of another error and not the actual cause of the problem (for example, a fault in the protection detection circuitry can also lead to a protection).

Table 5-1 Error code overview

Error	Device	Error description	Check item	Diagram
0	Not applicable	No Error		
1	Not applicable	X-Ray/Over-voltage protection (US only)	2411, 2412, 2413, 6404, 6411, 6412	A2
2	Not applicable	High beam (BCI) protection	3404, 7405	A2
3	Not applicable	Vertical guard protection	3466, 7451, 7452, 7453, 7454	A2
4	Tuner	I ² C error while communicating with 2nd tuner	1000, 5010, (PIP Module)	F2
5	Not applicable	+5v protection	7604, 7605	A5
6	I ² C bus	General I ² C error	7200, 3207, 3214	A4
7	Not applicable	Power down (over current) protection	-	-
8	Not applicable	EW protection (only for sets with EW circuitry)	-	-
9	24C16	I ² C error while communicating with the EEPROM	7601, 3604, 3605	A5
10	Tuner	I ² C error while communicating with the PLL tuner	1000, 5001	A3
11	TDA6107/A	Black current loop instability protection	7330, 3351, CRT	B1
12	SDA9488X	I ² C error while communicating with the PIP processor	7242 (PIP Module)	F1
13	Not applicable	I ² C error while communicating with the Voice Ctrl processor	-	-
14	DVD Loader	I ² C error while communicating with the DVD Interface module	DVD Interface module	DVD Loader
15	TDA9178T/N1	I ² C error while communicating with the LTI module	7610	H
16	TDA9887	I ² C error while communicating with the PIP Demodulator	7201	F2
17	ATSC module	I ² C error while communicating with the IBO module	-	ATSC
18	ATSC module	I ² C error while communicating with other I ² C IBO module	-	ATSC

Note: For all error codes the following applies: error codes are only valid when the module or device they refer to is used in the TV set.

5.5 The Blinking LED Procedure

Using this procedure, you can make the contents of the error buffer visible via the front LED. This is especially useful when there is no picture.

When the SDM is entered, the front LED will blink the contents of the error-buffer:

- When all the error-codes are displayed, the sequence finishes with a LED blink of 1.5 seconds,
- The sequence starts again.

Example of error buffer: **12 9 6 0 0**

After entering SDM, the following occurs:

- 1 long blink of 5 seconds to start the sequence,
- 12 short blinks followed by a pause of 1.5 seconds,
- 9 short blinks followed by a pause of 1.5 seconds,
- 6 short blinks followed by a pause of 1.5 seconds,
- 1 long blink of 1.5 seconds to finish the sequence,
- The sequence starts again at 12 short blinks.

5.6 Protections

If a fault situation is detected, an error code will be generated; and, if necessary, the television set will go into protection mode. Blinking of the red LED at a frequency of 3 Hz indicates the protection mode. In some error cases, the microprocessor does not put the set in protection mode. The error codes of the error buffer and the blinking LED procedure can be read via the Service Default Menu (SDM), or via ComPair.

To get a quick diagnosis the chassis has three service modes implemented:

- The (Digital) Customer Service Mode ((D)CSM).
- The Service Default Mode (SDM).
- The Service Alignment Mode (SAM).

For a detailed mode description, see the relevant sections.

5.7 Fault Finding and Repair Tips

Notes:

- It is assumed that the components are mounted correctly with correct values and no bad solder joints.
- Before any fault finding actions, check if the correct options are set.

5.7.1 NVM Editor

In some cases, it can be handy if one directly can change the NVM contents. This can be done with the "NVM Editor" in SAM mode. In the next table, some default NVM values are given.

Table 5-2 Default NVM values

Bit	Addr. (DEC)	27HT4000D/27 (HEX)	27HT7210D/27 (HEX)
EW (EW width)	58	28	2D
PW (EW parabola width)	59	13	14
HS (Horizontal shift)	53	2D	2B
HP (Horizontal Parallelogram)	54	2A	21
HB (Horizontal Bow)	55	20	1F
UCP(EW Upper Corner Parab.)	60	2A	29
LCP(EW Lower Corner Parab.)	61	30	33
TC (EW Trapezium)	62	12	14
VS (Vertical Slope)	63	1C	1F
VA (Vertical Amplitude)	64	15	1F
SC (S-Correction)	65	1E	1E
VSH (Vertical Shift)	66	1E	21
VX (Vertical Zoom)	67	19	19
VSC (Vertical scroll)	68	20	20
VL (Vertical linearity)	56	20	20
BLOR (Black Level Offset Red)	71	24	24
BLOG (Black Level Offset Grn)	72	1F	1F
AGC (AGC Take over)	69	14	14

Bit		Addr. (DEC)	27HT4000D/27 (HEX)	27HT7210D/27 (HEX)
OIF (IF-PLL Offset)		68	26	26
H60 (60 Hz Horizontal Shift)		150	00	00
PWL (Peak White Limit)		74	0A	0A
60 Hz Vertical amplitude		152	00	00
NVM_CVI_BLOR		71	24	24
NVM_CVI_BLOG		72	1F	1F
TXT Brightness		128	20	20
V60 offset (60Hz Vert. Ampl.)		151	00	00
NVM_CRYSTALALIGN		284	3F	3F
White-D Cool Red		134	20	20
White-D Cool Green		135	1B	1B
White-D Cool Blue		136	1A	1A
White-D Normal Red		137	00	00
White-D Normal Green		138	01	01
White-D Normal Blue		139	07	07
White-D Warm Red		140	00	00
White-D Warm Green		141	FB	FB
White-D Warm Blue		142	EF	EF

5.7.2 ATSC Module

ATSC Module check

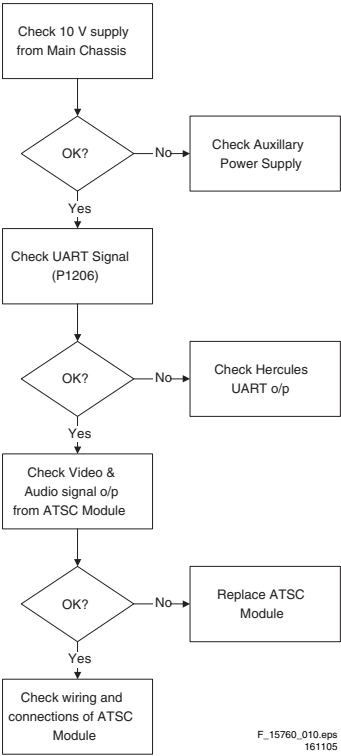


Figure 5-4 Fault finding tree “ATSC Module check”

5.7.3 Power Supply

Set Not Working

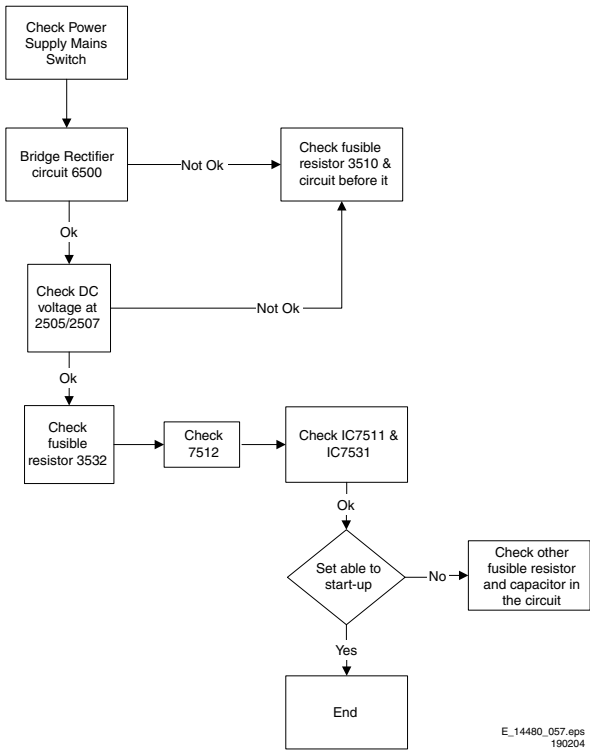


Figure 5-5 Fault finding tree “Set not working”

Set Does Not Start Up

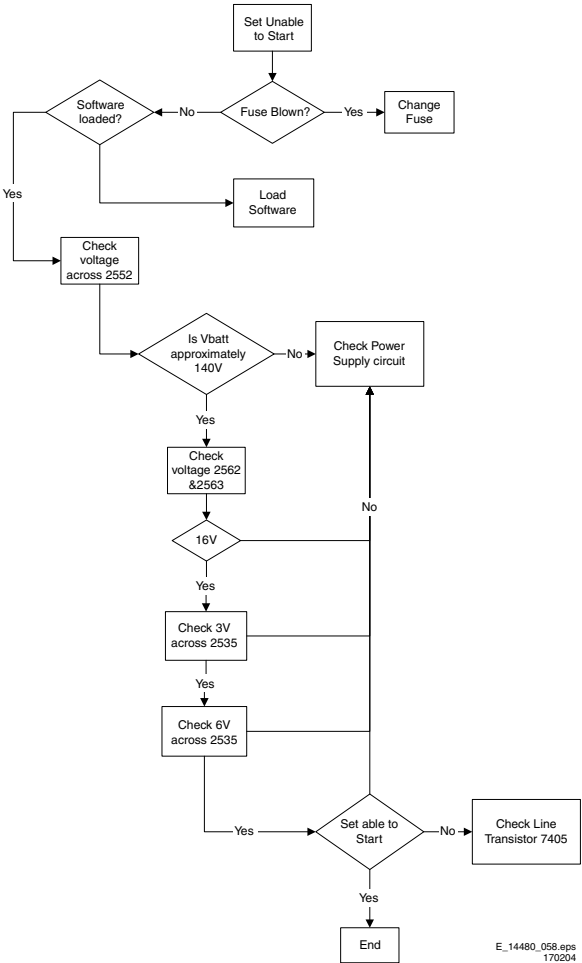


Figure 5-6 Fault finding tree “Set does not start up”

5.7.4 Deflection

One Thin Vertical Line

Quick check:

- Set in protection mode.
- LED blinking with error "3".

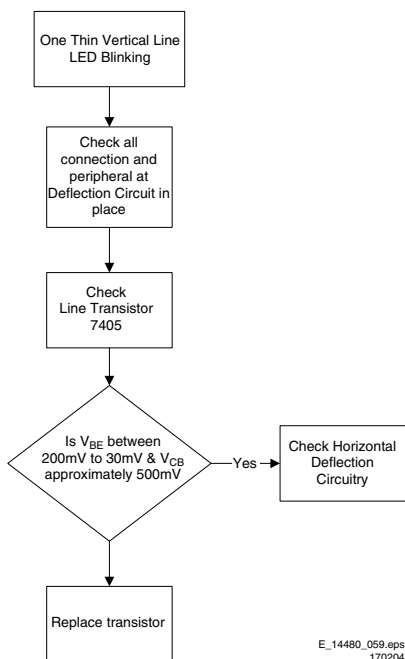


Figure 5-7 Fault finding tree "One thin vertical line"

One Thin Horizontal Line

Quick check:

- Set in protection mode.
- LED blinking with error "2".

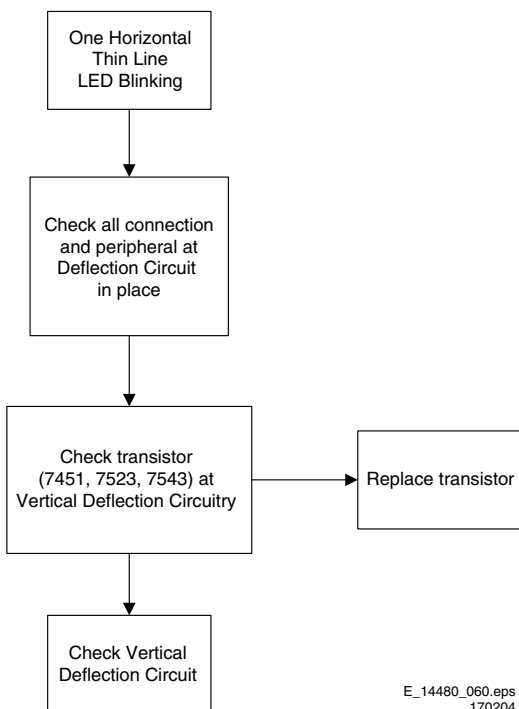


Figure 5-8 Fault finding tree "One thin horizontal line"

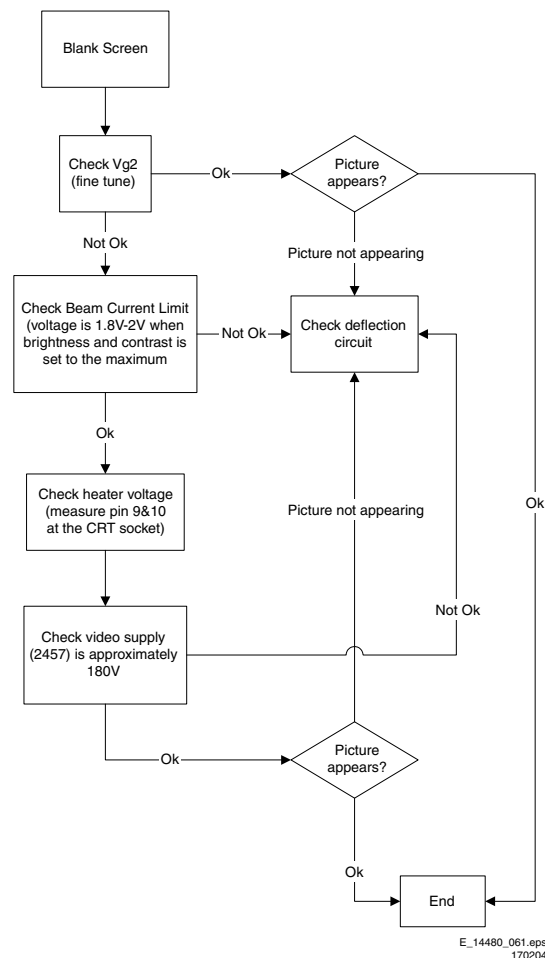
Blank Screen

Figure 5-9 Fault finding tree "Blank screen"

5.7.5 Source Selection

Set is not able to go into AV or any missing AV is encountered

E.g. AV1 is available but not able to enter to AV1: Check if the option setting is correct.

Set is able to go to AV, but no Audio is heard.

1. Check that continuity of signal is there from the SCART/ Cinch input to the input of the Hercules.
2. If continuity is there and still no audio, check that option settings are correct.
3. If logic setting is correct and still no audio, proceed to Audio Decoder/Processor troubleshooting section.

Set is able to go into AV but no Video is available:

1. Check continuity from AV input to Hercules depending on the input.
2. If continuity is available and yet no video, proceed to Video Processor troubleshooting section.

5.7.6 Tuner and IF

No Picture

1. Check that the Option settings are correct.
2. If correct, check that supply voltages are there.
3. If supply voltages are present, check whether picture is present in AV.
4. If picture is present in AV, check with the scope the Tuner IF output signal by manual storage to a known channel.
5. If IF output is present, Tuner is working fine. If no IF output, I2C data lines may be open, check continuity of I2C lines. If I2C lines are ok, Tuner may be defect, replaced Tuner.

6. If Tuner IF is present and yet still no picture in RF mode, go to Video Processing troubleshooting section.

No Picture, No Sound

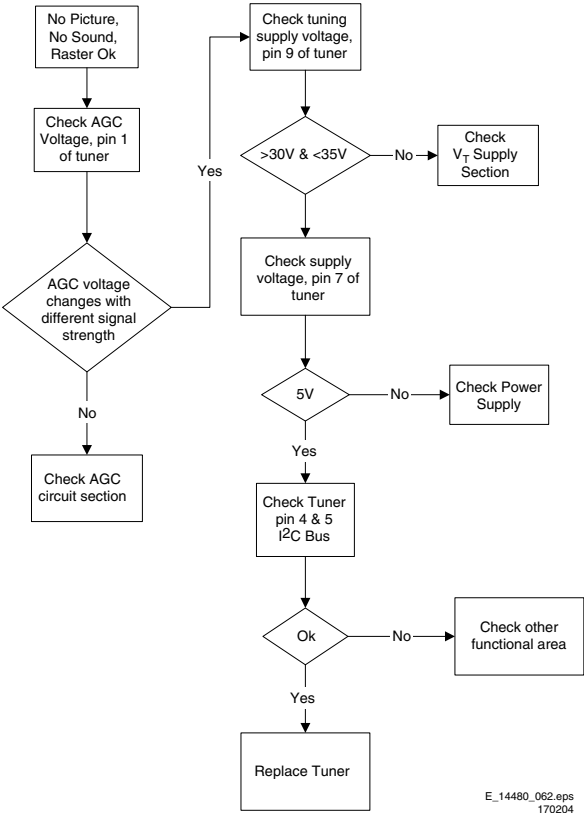


Figure 5-10 Fault finding tree “No picture, no sound”

Picture Ok, No Sound

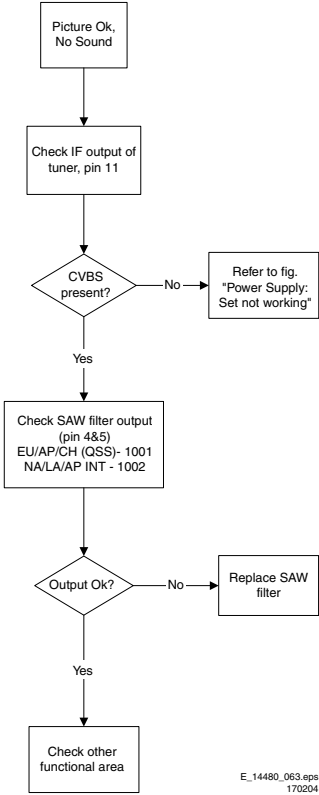


Figure 5-11 Fault finding tree “Picture ok, no sound”

Unable To Perform Tuning

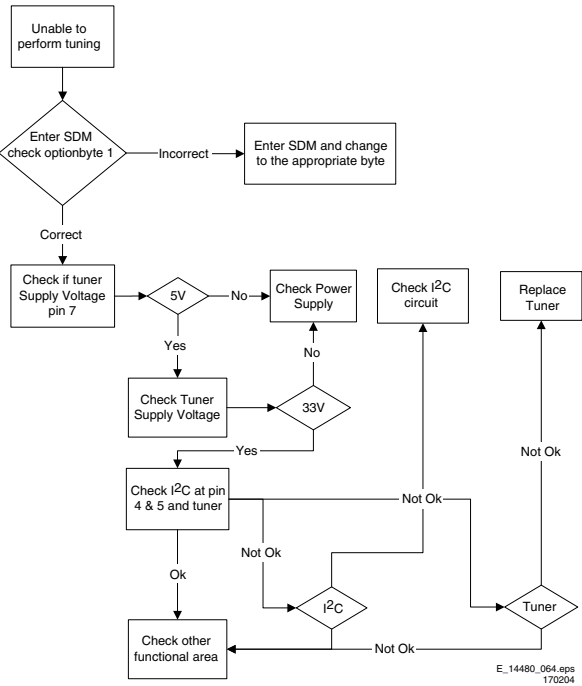


Figure 5-12 Fault finding tree “Unable to perform tuning”

5.7.7 Controller

Below are some guidelines for troubleshooting of the Micro Controller function. Normally Micro Controller should be checked when there is a problem of startup.

1. Check that both +3.3 V_{dc} and +1.8 V_{dc} are present.
2. Check that crystal oscillator is working.
3. Check that Power Good signal is at "high" logic, normal operation.
4. Check that Hercules is not in standby mode. Pin 15 of Hercules should be 0 V_{dc}.
5. Make sure H-drive pulse is there. This can be checked at resistor R3239. If H-drive does not exist, remove resistor R3239 to check if there is loading.

Note: When the set shuts down after a few second after power "on", the main cause is that Vg2 not aligned properly, try adjusting Vg2 during the few seconds of power "on".

5.7.8 Video Processing

No Picture

When "no picture in RF", first check if the microprocessor is functioning ok in section "Controller". If that is ok, follow the next steps.

When "no picture in AV", first check if the video source selection is functioning ok in section "Source Selection". If that is ok, follow the next steps.

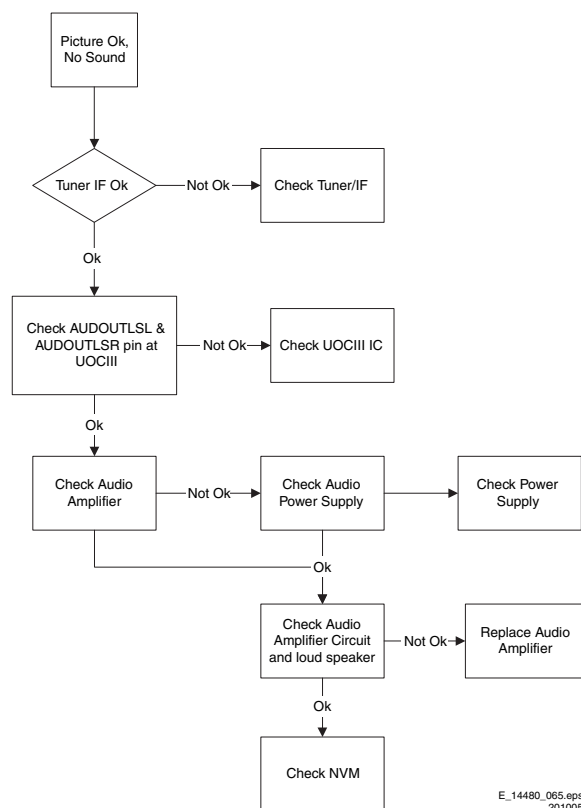
1. Check that normal operating conditions are met.
2. Check that there is video signal at pin 81. If no video, demodulator part of the Hercules is faulty, replace with new Hercules.
3. If video signal is available at pin 81, check pin 56, 57, and 58 for the RGB signal.
4. If signal is not available, try checking the BRIGHTNESS and/or CONTRAST control, and make sure it is not at zero.
5. If still with the correct settings and no video is available, proceed to the CRT/RGB amplifier diagram.

For sets with Scavem, and Scavem does not work, follow steps below:

1. Check Scavem coil connector (position is 1361) if connected; if not, connect it.
2. If connected, check NVM "bit storage" byte 1 bit 7; if it is not "1", set it to "1".
3. If it is "1", then check the data of the NVM addresses as in table "Default NVM values" (addresses 140, 141, and 142). If the data is not correct, then set these addresses to the table values.
4. If it still not works, track Scavem output from pin64 of Hercules to CRT panel.

5.7.9 Audio Processing

No Sound



E_14480_065.eps
201005

Figure 5-13 Fault finding tree "No sound"

No RF Audio for QSS/Inter-Carrier Stereo Sets.

1. Check pin 99 and 100 for SIF signal (for QSS) or pin 104 and 105 for video with SIF (for Inter-Carrier)
2. If signal is not present, check for the QSS/FMI bit settings. Check also the NVM data.
3. If signals are present and still no audio, check the audio supply voltage +8V are present.
4. If still no audio signal at Hercules output, Hercules is faulty.

No AV Audio.

1. Check troubleshooting methods in section "Source Selection".
2. Check the output of the Hercules to see if there is signal available. If no, check the normal operating condition and also the NVM data.
3. If still no audio signal at Hercules output, Hercules is faulty.

Note: If there is audio signal at Hercules output and no audio at loudspeaker, proceed to Audio Amplifier troubleshooting methods.

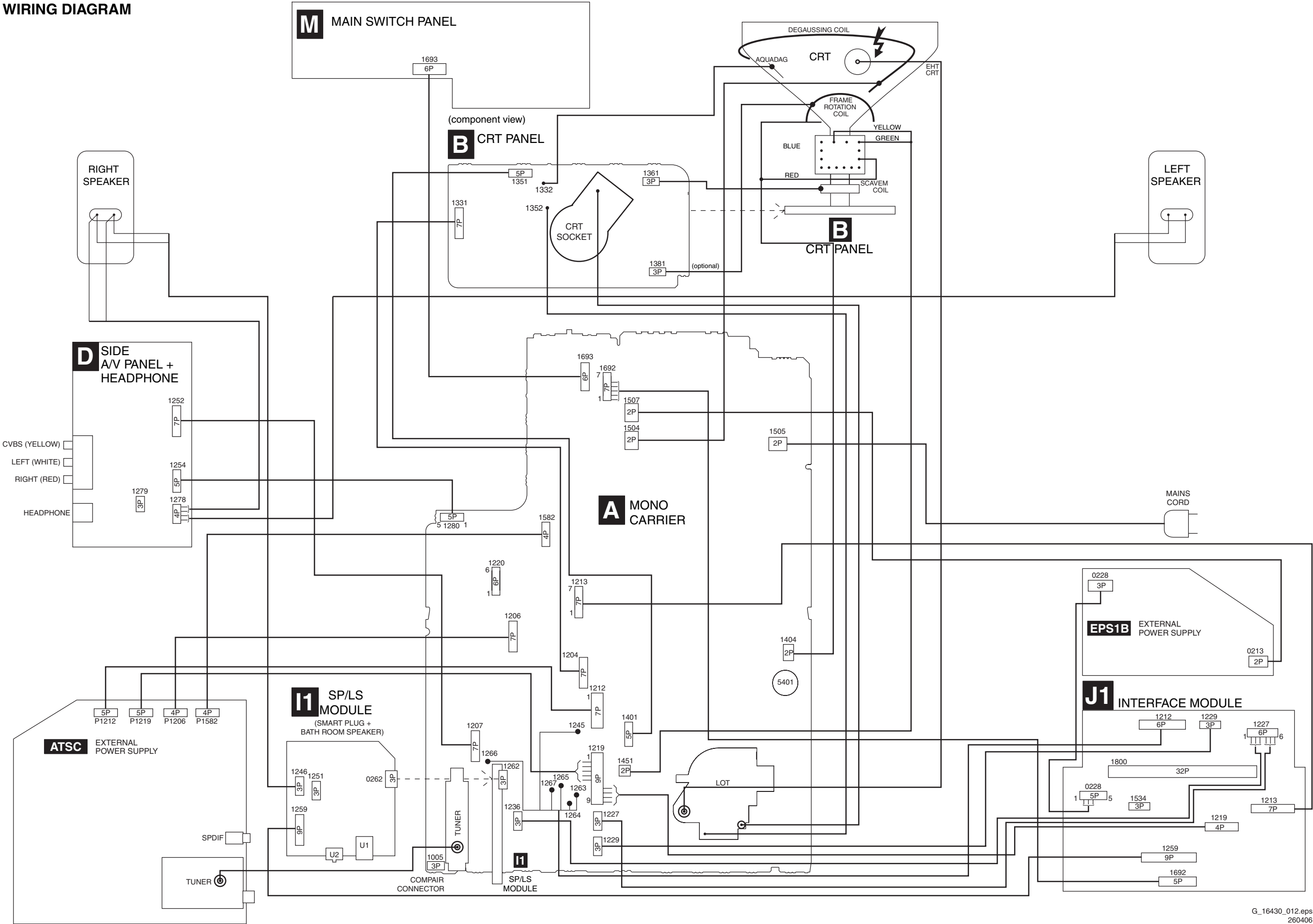
5.7.10 Audio Amplifier

No RF as well as AV Audio at the Loudspeaker:

1. Check that the normal operation condition of the amplifier is met.
2. If normal operation conditions are met, check the continuity from Hercules output to input of the amplifier.
3. If continuity is there and still no audio, check speaker wire connections. If still no audio, amplifier IC might be faulty.

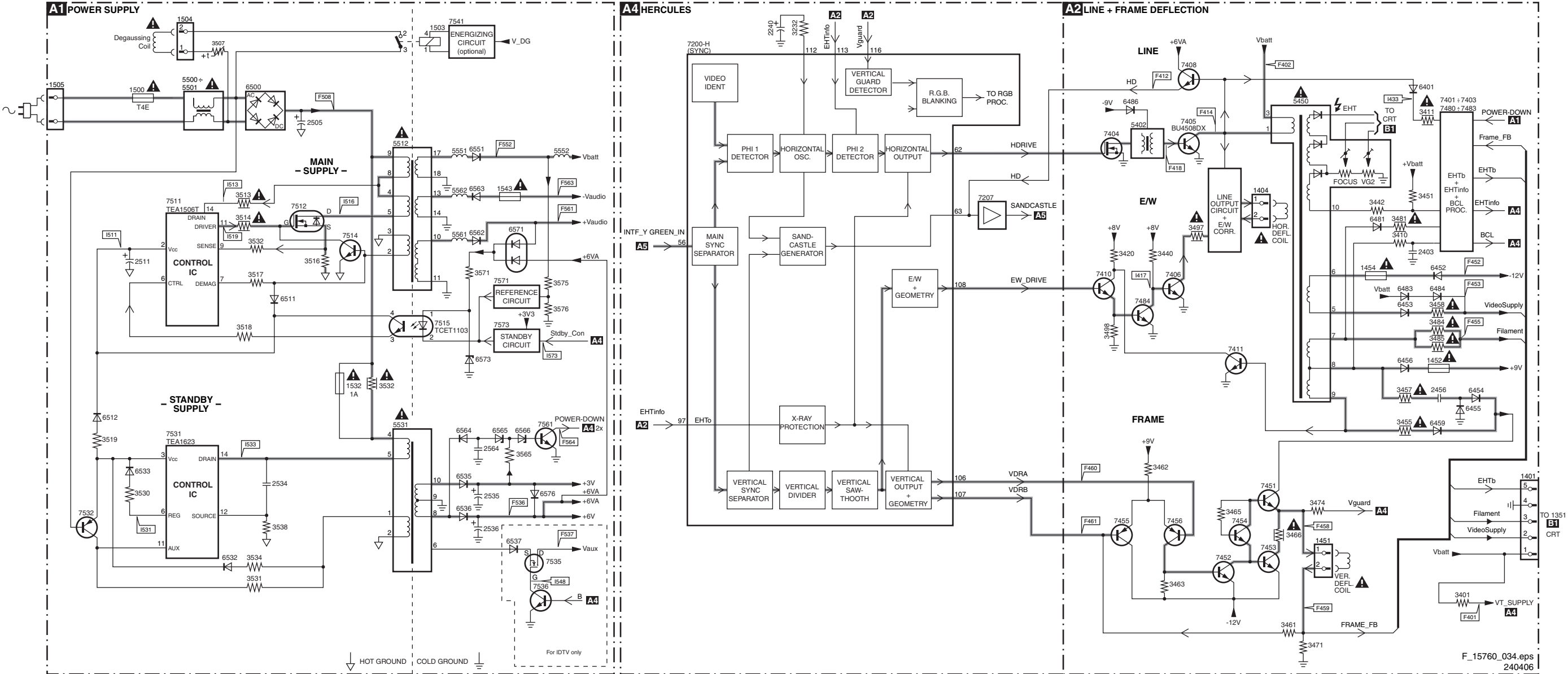
6. Block Diagrams, Test Point Overviews, and Waveforms

Wiring Diagram
WIRING DIAGRAM

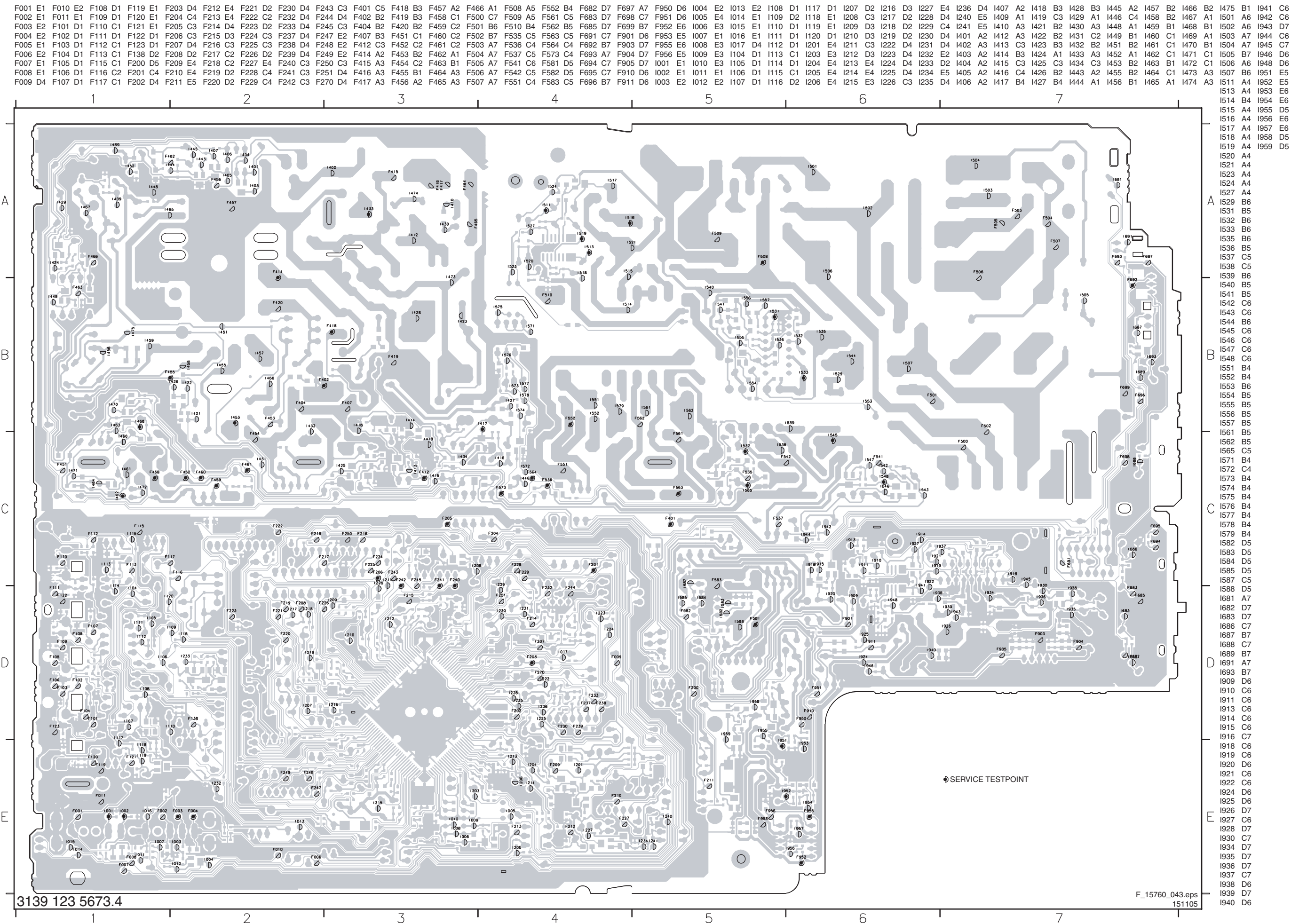


Block Diagram Supply and Deflection

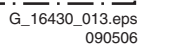
SUPPLY AND DEFLECTION



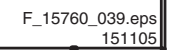
Testpoint Overview Mono Carrier



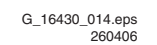
VIDEO



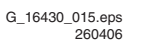
2



AUDIO



SUPPLY LINES DIAGRAM



7. Circuit Diagrams and PWB Layouts

Mono Carrier: Power Supply

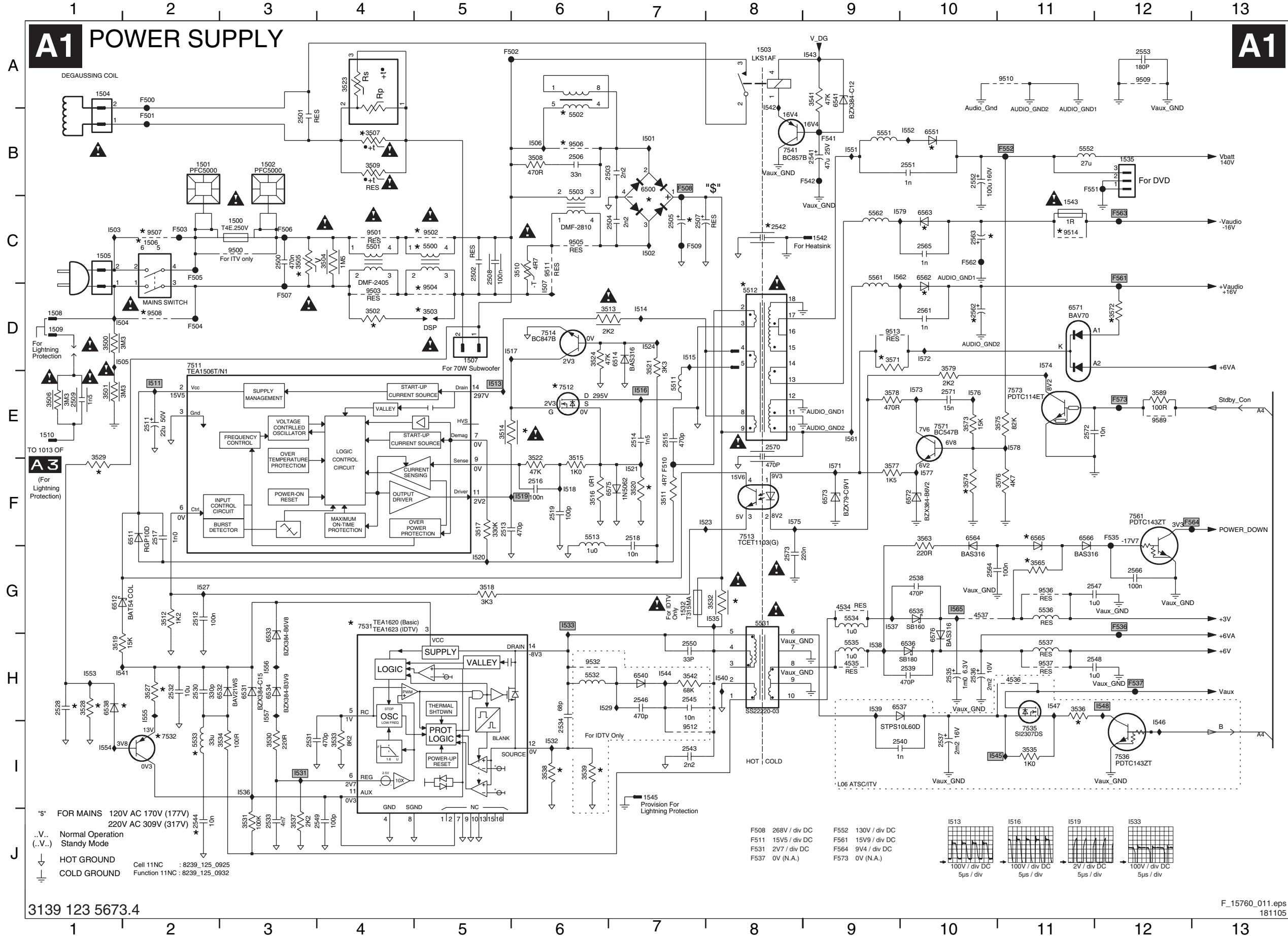


Table of component values and part numbers, organized in columns A through J.

Mono Carrier: Diversity Table for [A1]

1

2

3

4

5

6

7

8

9

10

11

12

13

DIVERSITY TABLE FOR

A1

POWER SUPPLY

REGION

NAFTA

MAIN RANGE

LR

27RF
27FSQ

32RF

26WSRF
30WSRF
32FSQ

21RF

25RF
29FSQ

29RF

29RF

28WSSF

28WSRF
32WSRF

130V

130V

143V

LATAM / AP

FR

21RF

25RF
29FSQ

29RF

29RF

28WSSF

28WSRF
32WSRF

130V

130V

130V

130V

143V

143V

CHINA

HR

21/25RF

29RF

34RF

130V

130V

130V

INDIA

HR

21/29RF
29FSQ

130V

130V

EUROPE

HR

21RF

29RF
28WSSF

29RF

24WR
25/28BLD

28WSRF

32WSRF

130V

130V

130V

143V

143V

143V

VBATT

130V

130V

143V

130V

130V

130V

130V

143V

143V

130V

130V

130V

130V

130V

130V

130V

143V

143V

143V

AUDIO
OUTPUT

2X5W
2X10W

2X5W
2X10W

2X5W
2X10W

2X10W

2X5W
2X10W

2X5W

2X10W

2X5W

2X10W

2X5W
2X10W

2X15W

2X5W
2X10W

2X5W

2X10W

2X5W
2X10W

2X5W

2X10W

2X5W
2X10W

2X5W
2X10W

2X5W

1508

WIRE SIN
180 SIN
18ST BK

WIRE SIN
180 SIN
18ST BK

WIRE SIN
180 SIN
18ST BK

WIRE SIN
180 SIN
18ST BK

WIRE SIN
180 SIN
18ST BK

WIRE SIN
180 SIN
18ST BK

WIRE SIN
180 SIN
18ST BK

WIRE SIN
180 SIN
18ST BK

WIRE SIN
180 SIN
18ST BK

WIRE SIN
180 SIN
18ST BK

WIRE SIN
180 SIN
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2505

200V 470U

200V 470U

200V 470U

400V 330U

400V 330U

400V 330U

400V 330U

400V 330U

400V 330U

450V 220U

450V 220U

450V 220U

450V 220U

450V 220U

400V 220U

400V 220U

400V 220U

400V 220U

400V 220U

2506

2508

275V 100N

275V 100N

275V 100N

275V 100N

275V 100N

275V 100N

275V 100N

275V 100N

275V 100N

275V 100N

275V 100N

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275V 100N

2509

250V 1N5

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250V 1N5

250V 1N5

250V 1N5

250V 1N

250V 1N

250V 1N

250V 1N

250V 1N

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250V 1N

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250V 1N

250V 1N

250V 1N

2570

250V 470P

250V 470P

250V 470P

250V 470P

250V 470P

250V 470P

250V 470P

250V 470P

250V 470P

250V 470P

250V 470P

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250V 470P

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250V 470P

3505

1MA/423V

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1MA/423V

1MA/612V

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1MA/612V

3506

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3507

144V 3R

144V 3R

3508

3514

100R

100R

100R

47R

47R

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47R

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3520

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3523

145V 1R5

276V 4R5

276V 4R5

276V 4R5

276V 4R5

276V 4R5

276V 4R5

276V 4R5

276V 4R5

276V 4R5

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5502

5512

SS40310-01

SS40310-01

SS40312-01

SS42315-01

SS42315-01

SS42315-01

SS49309-01

SS42316-01

SS49308-01

SS42315-01

SS42315-01

SS42315-01

SS42315-01

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STTH8L06D

BYV29X-500

BYV29X-500

STTH8L06D

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BYV29X-500

6565

UDZS9.1B

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UDZS7.5B

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FQPF9N50

FQPF9N50

FQPF9N50

FQPF7N80

BC857B

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FQPF7N80

FQPF7N80

FQPF7N80

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REGION

ATSC

MAIN RANGE

LR

SET

L06
27RF

L06
27FSQ

L06
32FS

L06
32RF

VBATT

130V

130V

143V

130V

AUDIO
OUTPUT

2X5W

2X5W

2X5W

2X5W

1545

SIN 560

SIN 560

SIN 560

SIN 560

2505

200V 680U

200V 680U

200V 680U

200V 680U

2537

25V 2200U

25V 2200U

25V 2200U

25V 2200U

2544

50V 1NF

50V 1NF

50V 1NF

50V 1NF

2545

400V 4N7

400V 4N7

400V 4N7

400V 4N7

2546

1KV 470P

1KV 470P

1KV 470P

1KV 470P

2570

250V 470P

250V 470P

250V 470P

250V 470P

3532

1R5

1R5

1R5

1R5

3533

5K6

5K6

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3535

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3538

1R2

1R2

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3539

1R2

1R2

1R2

1R2

3542

150K

150K

150K

150K

3574

150K

150K

33K

150K

5500

DMF2810

DMF2810

DMF2810

DMF2810

5512

SS40511-00

SS40511-00

SS40512-00

SS40511-00

5531

SS22508-01

SS22508-01

SS22508-01

SS22508-01

5532

50R 100MHZ

50R 100MHZ

50R 100MHZ

50R 100MHZ

5533

1U0

1U0

1U0

1U0

6500

GBU4J

GBU4J

GBU6J

GBU6J

6536

SB240

SB240

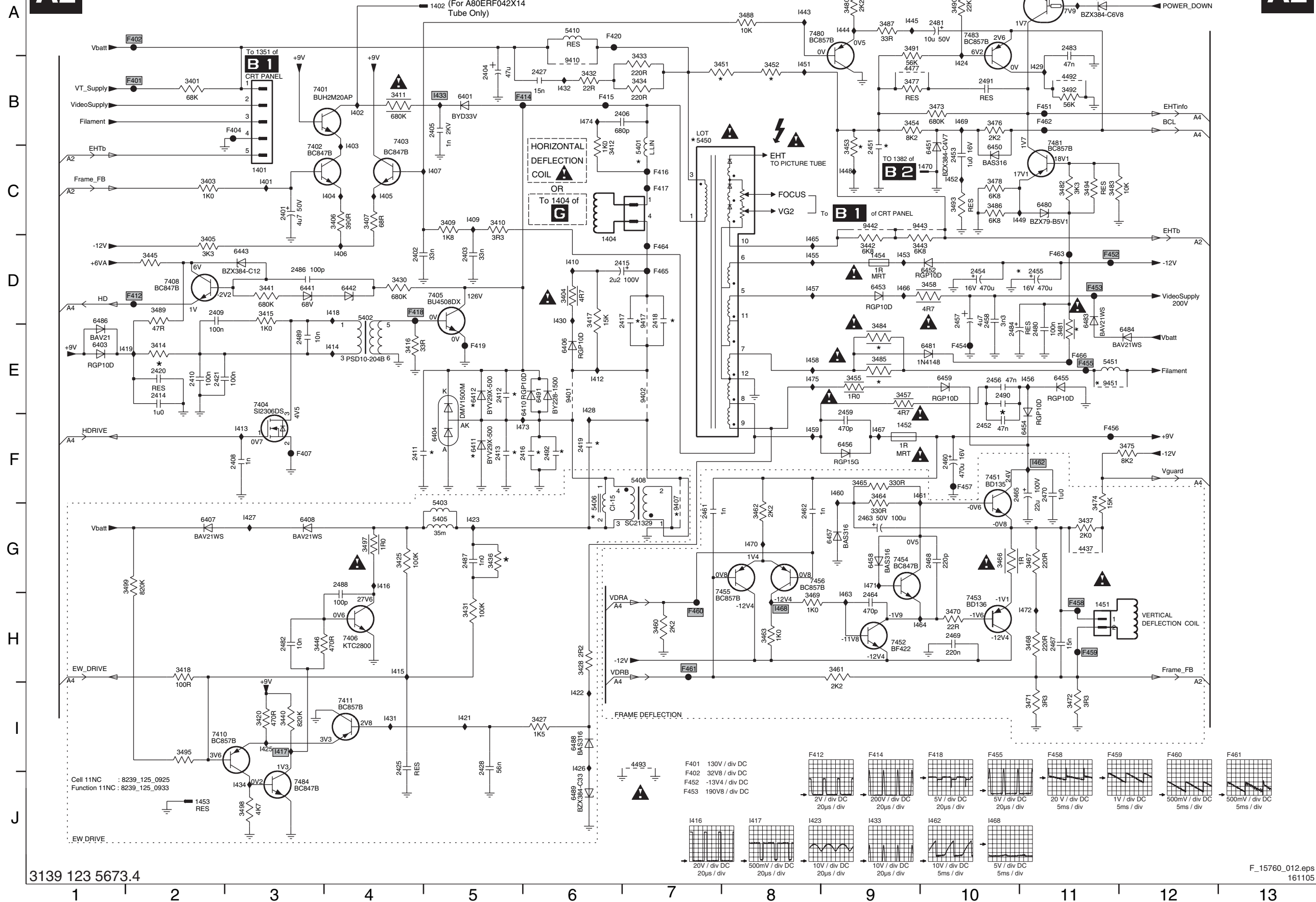
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SB240

6537

STPS10LD60

A2 LINE + FRAME DEFLECTION



1401 B3	5405 E5	5468 F8
1402 A4	5406 E6	
1404 C6	5408 E7	W70 F7
1405 B3	5409 E8	W71 F8
1452 E9	5450 B7	W72 F10
1453 H3	5515 D10	W73 E5
1454 C3	6401 B5	W74 B6
1455 B3	6402 B6	W75 B8
2401 C3	6404 E5	
2402 C4	6406 D6	
2403 C3	6407 E3	
2404 A5	6408 E4	
2405 B6	6410 D5	
2406 B6	6411 D5	
2408 E3	6412 D5	
2409 D3	6414 C4	
2410 D3	6415 C4	
2411 E4	6416 C3	
2412 D5	6420 B9	
2413 E5	6421 B8	
2414 D2	6429 B9	
2415 C6	6455 C8	
2416 E5	6454 E10	
2417 D6	6455 D10	
2418 E9	6456 D9	
2419 D2	6457 E8	
2420 D2	6458 F8	
2421 E9	6459 D9	
2425 C4	6480 C10	
2427 A6	6481 D9	
2428 E5	6482 D10	
2431 B8	6483 D10	
2453 B9	6486 D2	
2454 C9	6487 D9	
2455 C10	6489 B6	
2456 D9	6491 D5	
2457 B9	7001 B4	
2458 D9	7002 B4	
2459 D5	7003 D3	
2459 E9	7404 B3	
2459 E7	7405 E5	
2462 E8	7406 F4	
2463 E8	7408 C2	
2464 F8	7410 C3	
2465 B9	7411 G4	
2467 F10	7451 E9	
2468 F9	7452 F9	
2469 E8	7453 F8	
2470 E10	7454 F9	
2470 E10	7455 F7	
2471 E8	7456 F8	
2482 D3	7480 A8	
2483 A10	7481 B10	
2484 D10	7482 B10	
2486 C3	7483 A9	
2487 E5	7484 B3	
2488 F4	7491 C4	
2489 C3	7492 B5	
2490 D10	9007 E7	
2491 B9	9410 A6	
2492 E6	9417 D6	
3401 B3	9420 B5	
3403 B3	9443 C9	
3404 C6	9452 A2	
3405 C3	9451 B2	
3407 C3	9404 B3	
3409 C5	9453 E3	
3410 C5	9452 C2	
3411 B4	9414 B5	
3412 B6	9415 B6	
3413 E7	9416 B7	
3415 D3	9417 B7	
3416 D4	9418 D4	
3417 D6	9420 B6	
3418 E2	9420 A6	
3420 D3	9451 B10	
3425 F4	9452 C10	
3426 E6	9453 D10	
3428 E6	9454 D9	
3429 E10	9455 D10	
3430 C10	9456 D10	
3432 A6	9457 E9	
3433 A6	9458 F10	
3434 B6	9459 F7	
3435 E10	9460 F7	
3437 D3	9461 G7	
3440 C3	9462 B10	
3441 C3	9463 C10	
3442 C8	9464 C7	
3443 C9	9465 C7	
3445 C2	9466 C7	
3446 F4	9401 B3	
3451 A7	9402 B4	
3452 A8	9403 B4	
3453 B8	9404 B4	
3454 B9	9405 C4	
3455 D8	9406 C4	
3456 D8	9407 C4	
3457 D8	9408 C5	
3458 C9	9409 C5	
3460 F7	9410 C6	
3461 E8	9412 D6	
3462 E7	9413 C3	
3463 F7	9414 D4	
3464 E8	9415 C4	
3465 E8	9416 B5	
3466 F9	9417 G3	
3467 F10	9418 D4	
3468 F10	9419 D2	
3469 F9	9420 B5	
3470 F9	9422 G6	
3471 G10	9423 E5	
3472 D10	9424 B6	
3473 B9	9425 G3	
3474 E10	9426 G6	
3475 E11	9427 E3	
3476 B9	9428 B6	
3477 B9	9429 D10	
3478 A8	9430 A4	
3479 A8	9431 B4	
3481 D10	9432 B6	
3482 B10	9433 B5	
3483 B10	9434 B3	
3484 D8	9435 A8	
3485 D8	9444 A8	
3486 A9	9445 A9	
3487 A9	9446 B10	
3488 A7	9448 B8	
3489 A7	9449 C10	
3490 B9	9450 B8	
3491 A9	9452 B9	
3492 B10	9453 C9	
3493 B9	9455 C8	
3494 B10	9456 D	
3495 E2	9457 C8	
3497 F4	9458 D8	
3498 H3	9459 B8	
3499 F2	9460 E8	
4337 F10	9461 E9	
4777 A9	9462 E10	
4787 B8	9463 B8	
4933 G6	9464 F9	
5019 B6	9465 C8	
5020 D4	9466 B8	
5403 E5	9467 E8	

Mono Carrier: Diversity Table for [A2]

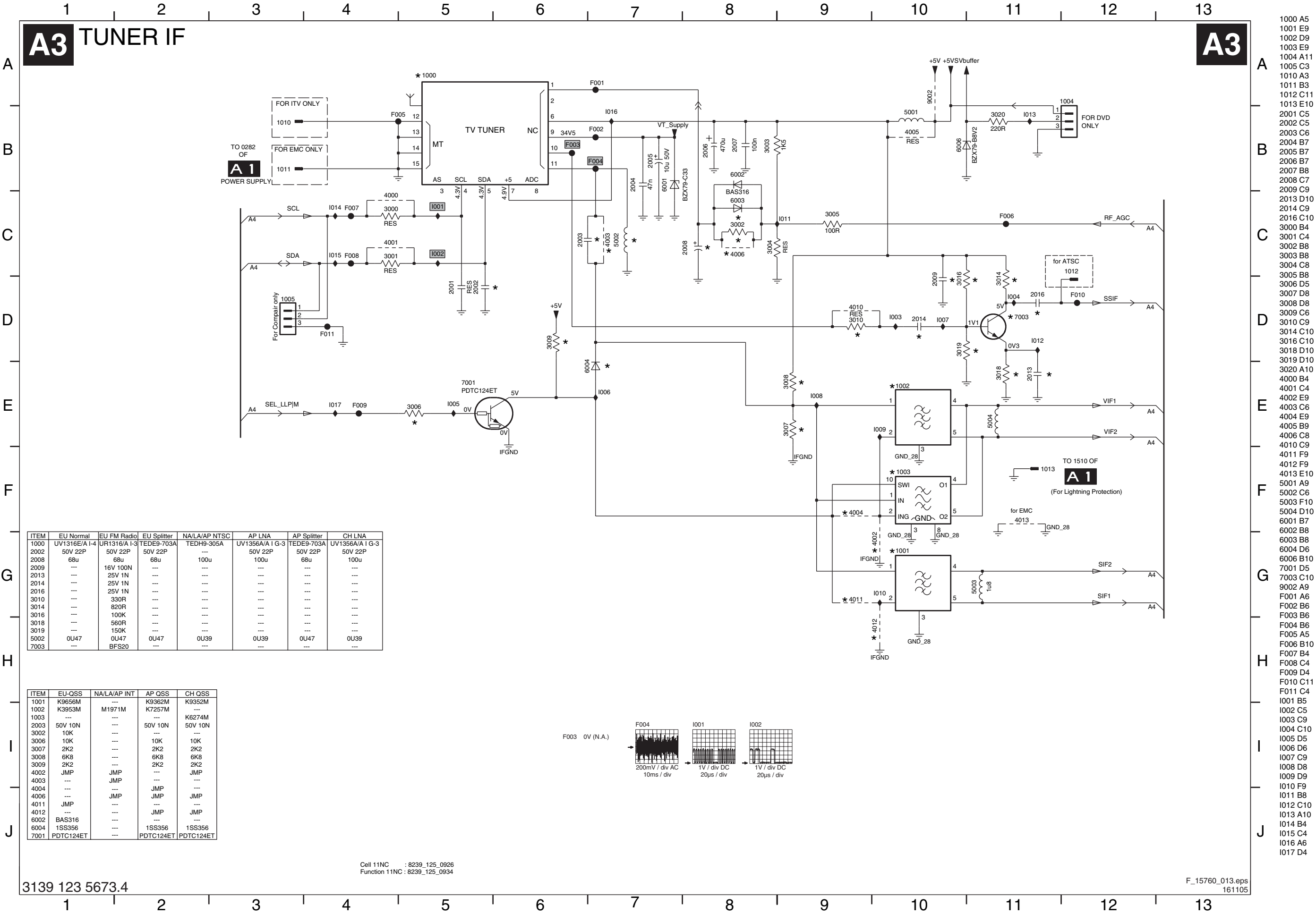
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DIVERSITY TABLE FOR **A2** DEFLECTION

Region	NAFTA							LATAM						AP					CHINA				INDIA		
Tube	LPD	LPD	LPD	LPD	LPD	LPD	SMGK	LPD	LPD	LPD	LPD	LPD	SMGK	CPT	LPD	LPD	LPD	LPD	LPD	LPD	LPD	LPD	CPD	LPD	SMGK
Size	27 V	28 WR	29 RF	32 V	32 V RF	32 WR	25 RF	25 RF	27V	28WS	28WR	32WR	29RF	21RF	25RF	29RF	32WR	34RF	25RF	21RF	29RF	34RF	21RF	29RF	29FSQ
2411	470pF	1.2nF	1.5nF	2.2nF	680pF	330pF	1.2nF	680nF	470pF	1.2nF	1.2nF	330pF	1.5nF	220pF	680nF	1.2nF	330pF	1nF	680nF	220pF	1.2nF	1nF	220pF	1.2nF	680pF
2412	12nF	13nF	15nF	15nF	12nF	15nF	13nF	15nF	15nF	15nF	13nF	15nF	15nF	15nF	15nF	15nF	13nF	12nF	15nF	15nF	15nF	12nF	15nF	13nF	
2413	120nF	15nF	39nF	33nF	33nF	18nF	33nF	33nF	120nF	18nF	15nF	18nF	39nF	68nF	33nF	33nF	18nF	33nF	33nF	68nF	33nF	68nF	33nF	39nF	
2416	-	3n3	-	4n7	-	-	4n7	-	-	2n2	3n3	-	-	-	3n3	-	3n3	-	-	-	3n3	-	3n3	-	
2418	390nF	-	330nF	470nF	270nF	-	390nF	360nF	390nF	-	390nF	-	330nF	220nF	360nF	330nF	300nF	360nF	360nF	270nF	330nF	300nF	220nF	330nF	
2419	-	390nF	2u2	2u2	2u2	430nF	2u2	2u2	470nF	390nF	430nF	2u2	2u2	-	2u2	2u2	430nF	2u2	2u2	-	2u2	2u2	-	390nF	
2425	-	33nF	33nF	33nF	10nF	33nF	33nF	33nF	33nF	33nF	33nF	33nF	33nF	33nF	33nF	33nF	33nF	10nF	33nF	-	33nF	10nF	-	33nF	
2451	150nF	150nF	180nF	180nF	150nF	180nF	100nF	100nF	150nF	120nF	150nF	180nF	100nF	120nF	120nF	220nF	180nF	270nF	120nF	220nF	220nF	270nF	120nF	220nF	
2457	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7	
2487	-	1n5	1n5	1n5	2n2	1n5	1n5	1n5	-	1n5	1n5	1n5	3n3	1nF	1n5	1nF	1n5	3n3	1n5	1nF	1nF	3n3	1nF	1nF	
2490	47n	-	-	-	-	-	47n	-	47n	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3224	680K 5%	680K 5%	680K 5%	680K 5%	560K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	560K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	1M 5%	680K 5%	1M 5%	680K 5%	1M 5%	1M 5%	680K 5%	
3295	8K2 5%	10K 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	
3414	1R 1W 5%	2R2 1W 5%	1R 1W 5%	0R33 1W 5%	1R 1W 5%	6R8 1W 5%	3R3 1W 5%	1R 1W 5%	1R 1W 5%	4R7 1W 5%	2R2 1W 5%	6R8 1W 5%	0R33 1W 5%	10R 1W 5%	1R 1W 5%	1R 1W 5%	6R8 1W 5%	6R8 1W 5%	1R 1W 5%	4R7 1W 5%	1R 1W 5%	6R8 1W 5%	10R 1W 5%	1R 1W 5%	
3431	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	
3451	68K 1%	82K 1%	68K 1%	75K 1%	68K 1%	82K 1%	68K 1%	68K 1%	68K 1%	120K 1%	82K 1%	82K 1%	68K 1%	82K 1%	68K 1%	68K 1%	68K 1%	68K 1%	68K 1%	68K 1%	68K 1%	68K 1%	68K 1%	56K 1%	
3452	18K 5%	15K 5%	15K 5%	15K 5%	6K8 5%	18K 5%	18K 5%	18K 5%	18K 5%	15K 5%	18K 5%	18K 5%	15K 5%	18K 5%	18K 5%	18K 5%	18K 5%	18K 5%	18K 5%	18K 5%	18K 5%	18K 5%	18K 5%	15K 5%	
3453	33K 5%	22K 5%	33K 5%	22K 5%	33K 5%	22K 5%	33K 5%	33K 5%	33K 5%	33K 5%	22K 5%	22K 5%	33K 5%	33K 5%	33K 5%	33K 5%	33K 5%	33K 5%	33K 5%	33K 5%	33K 5%	33K 5%	33K 5%	33K 5%	
3467	120R 5%	120R 5%	120R 5%	220R 5%	150R 5%	220R 5%	120R 5%	120R 5%	120R 5%	220R 5%	120R 5%	120R 5%	120R 5%	120R 5%	220R 5%	120R 5%	120R 5%	150R 5%	120R 5%	220R 5%	150R 5%	120R 5%	120R 5%	220R 5%	
3468	220R 5%	150R 5%	150R 5%	150R 5%	150R 5%	220R 5%	150R 5%	150R 5%	220R 5%	220R 5%	150R 5%	220R 5%	150R 5%	220R 5%	220R 5%	150R 5%	150R 5%	150R 5%	150R 5%	220R 5%	150R 5%	150R 5%	220R 5%	220R 5%	
3471	-	2R7 1%	2R4 1%	2R4 1%	2R2 1%	2R2 1%	2R2 1%	2R4 1%	-	2R2 1%	2R7 1%	1R8 1%	1R8 1%	2R2 1%	2R4 1%	2R4 1%	1R8 1%	2R2 1%	2R4 1%	3R9 1%	2R4 1%	2R2 1%	2R2 1%	2R2 1%	
3472	3R3 1%	2R4 1%	2R4 1%	2R7 1%	2R2 1%	3R3 1%	2R 1%	2R4 1%	3R3 1%	3R3 1%	2R4 1%	3R9 1%	2R4 1%	3R9 1%	2R4 1%	2R4 1%	3R3 1%	2R2 1%	2R4 1%	4R7 1%	2R4 1%	2R2 1%	3R9 1%	2R4 1%	
3473	390K 5%	680K 5%	820K 5%	820K 5%	820K 5%	820K 5%	680K 5%	820K 5%	390K 5%	1M 5%	680K 5%	820K 5%	1M 5%	390K 5%	820K 5%	820K 5%	430K 5%	430K 5%	820K 5%	680K 5%	430K 5%	430K 5%	390K 5%	680K 5%	
3474	15K 5%	12K 5%	15K 5%	15K 5%	15K 5%	15K 5%	15K 5%	15K 5%	15K 5%	15K 5%	12K 5%	15K 5%	15K 5%	15K 5%	15K 5%	15K 5%	15K 5%	15K 5%	15K 5%	15K 5%	15K 5%	15K 5%	15K 5%	15K 5%	
3481	5R6 5%	5R6 5%	5R6 5%	5R6 5%	5R6 5%	4R7 5%	-	5R6 5%	-	5R6 5%	5R6 5%	4R7 5%	-	-	-	-	4R7 5%	-	-	-	-	-	-	-	
3482	22K 1%	22K 1%	2K4 1%	22K 1%	22K 1%	22K 1%	-	-	22K 1%	-	22K 1%	22K 1%	-	-	-	-	22K 1%	-	-	-	-	-	-	-	
3483	56K 1%	56K 1%	56K 1%	56K 1%	56K 1%	56K 1%	-	-	56K 1%	-	56K 1%	56K 1%	-	-	-	-	56K 1%	-	-	-	-	-	-	-	
3491	100K 5%	100K 5%	100K 5%	82K 5%	68K 5%	82K 5%	100K 5%	100K 5%	100K 5%	82K 5%	100K 5%	82K 5%	82K 5%	82K 5%	100K 5%	82K 5%	82K 5%	82K 5%	100K 5%	56K 5%	82K 5%	82K 5%	82K 5%	56K 5%	
3494	180K 5%	-	100K 5%	150K 5%	680K 5%	680K 5%	-	180K 5%	-	180K 5%	-	680K 5%	-	-	-	680K 1%	-	-	-	-	-	-	-	-	
3499	680K 5%	680K 5%	680K 5%	330K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	
5401	50uH	42uH	33uH	33uH	25uH	42uH	33uH	37uH	50uH	50uH	16uH	42uH	25uH	82uH	37uH	33uH	42uH	42uH	82uH	33uH	42uH	82uH	33uH	33uH	
5408	-	SC2132 9-00B	CU15	CU15	CU15	SC2132 9-00B	CU15	CU15	-	SC2132 9-00B	SC2132 9-00B	SC2132 9-00B	CU15	-	CU15	CU15	SC2132 9-00B	CU15	CU15	-	CU15	CU15	-	CU15	
5450	JF0501-21835B	JF0501-85021B	JF0501-21836B	JF0501-21140B	JF0501-85020B	JF0501-21835B	JF0501-21835B	JF0501-21135B	JF0501-21135B	JF0501-85021B	JF0501-85021B	JF0501-2136B	JF0501-2136B	JF0501-2136B	JF0501-2135B	JF0501-2135B	JF0501-2136B	JF0501-2136B	JF0501-2601B	JF0501-2135B	JF0501-2136B	JF0501-2601B	JF0501-2135B		
5451	27uH 10%	JMP	33uH 10%	27uH 10%	JMP	JMP	33uH 10%	27uH 10%	27uH 10%	39uH 10%	JMP	JMP	27uH 10%	68uH 5%	27uH 10%	27uH 10%	0.58mm COL	22uH	27uH 10%	68uH 5%	27uH 10%	22uH	68uH 5%	27uH 10%	
6404	DVM1500M	-	DVM1500M	DVM1500M	DVM1500M	-	DVM1500M	DVM1500M	DVM1500M	-	DVM1500M	-	DMV1500M	DVM1500M	DVM1500M	DVM1500M	DVM1500M	DVM1500M	DVM1500M	DVM1500M	DVM1500M	DVM1500M	DVM1500M	DVM1500M	
6411	-	BY229X-800	-	-	-	BY229X-800	-	-	-	BY229X-80	BY229X-80	BY229X-800	-	-	-	-	BY229X-800	-	-	-	-	-	-	-	
6412	-	BY359X-1500	-	-	-	BY359X-1500	-	-	-	BY359X-1500	BY359X-1500	BY359X-1500	-	-	-	-	BY359X-1500	-	-	-	-	-	-	-	
7405	BU4508DX	BU2725DX	BU4508DX	BU2725DX	BU4508DX	BU2725DX	BU4508DX	BU4508DX	BU4508DX	BU4508DX	BU4508DX	BU2725DX	BU4508DX	BU4508DX	BU4508DX	BU4508DX	BU4508DX	BU4508DX	BU4508DX	BU4508DX	BU4508DX	BU4508DX	BU4508DX	BU4508DX	
9407	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
9417	-	JMP	-	-	-	JMP	-	-	-	JMP	JMP	JMP	-	-	-	-	-	-	-	-	-	-	-	-	

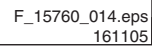
Region	EUROPE							
Tube	LPD	LPD	LPD	LPD	LPD	LPD	LPD	LPD
Size	21RF	24 WR	25 I	28 I	29 RF	28 WR	28 WS	32 WR
2411	470pF	1n2	470pF	470pF	1nF	680pF	680pF	680pF
2412	8n2	13nF	9n1	11nF	13nF	11nF	11nF	11nF
2413	33nF	15nF	18nF	18nF	33nF	15nF	15nF	15nF
2416	-	2n2	-	-	-	4n7	2n2	4n7
2418	470nF	-	390nF	390nF	360nF	-	-	-
2419	2u2	470nF	470nF	470nF	2u2	430nF	470nF	430nF
2425	33nF	33nF	33nF	33nF	33nF	33nF	33nF	33nF
2451	220nF	220nF	220nF	220nF	220nF	220nF	220nF	220nF
2457	4u7	4u7	4u7	4u7	4u7	4u7	4u7	4u7
2487	1nF	1nF	1nF	1nF	1nF	1nF	1nF	1nF
2490	47n	-	-	-	-	-	-	-
3224	1M 5%	1M 5%	1M 5%	1M 5%	1M 5%	1M 5%	1M 5%	1M 5%
3295	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%	8K2 5%
3414	4R7 1W	4R7 1W	10R 1W 5%	10R 1W 5%	2R2 1W	3R3 1W	4R7 1W	3R3 1W
3431	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	82K 1%	68K 1%
3451	68K 1%	120K 5%	120K 5%	68K 1%	68K 1%	68K 1%	18K 5%	18K 5%
3452	18K 5%	18K 5%	18K 5%	18K 5%	18K 5%	18K 5%	18K 5%	220R 5%
3453	22K 5%	22K 5%	33K 5%	33K 5%	33K 5%	22K 5%	22K 5%	220R 5%
3467	220R 5%	220R 5%	220R 5%	220R 5%	220R 5%	220R 5%	220R 5%	1R5 1%
3468	220R 5%	220R 5%	220R 5%	220R 5%	220R 5%	220R 5%	220R 5%	6R8 1%
3471	3R3 1%	3R3 5%	1R5 1%	1R5 1%	2R2 1%	1R5 1%	3R3 1%	470K 5%
3472	3R3 1%	3R3 1%	2R2 1%	2R2 1%	2R2 1%	6R8 1%	3R3 1%	15K 5%
3473	470K 5%	470K 5%	680K 5%	680K 5%	680K 5%	470K 5%	470K 5%	-
3474	15K 5%	15K 5%	15K 5%	15K 5%	15K 5%	15K 5%	15K 5%	-
3481	-	-	-	-	-	-	-	-
3482	-	-	-	-	-	-	-	56K 5%
3483	-	-	-	-	-	-	-	56K 5%
3491	56K 5%	56K 5%	56K 5%	56K 5%	56K 5%	56K 5%	56K 5%	-
3494	56K 5%	56K 5%	56K 5%	56K 5%	56K 5%	56K 5%	56K 5%	680K 5%
3499	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%	680K 5%
5401	82uH	37uH	50uH	50uH	25uH	50uH	25uH	25uH
5408	CUI5	SC21329-00B	SC21329-00B	SC21329-00B	CUI5	SC21329-00B	SC21329-00B	SC21329-00B
5450	1342.0033CY	1342.0048B	1342.0048B	1342.0048B	1362.0016AB	1362.0015AB	1342.0042CY	1362.0015AB
5451	22uH 10%	22uH 10%	27uH 10%	27uH 10%	39uH 10%	0.588 COL	22uH 10%	33uH 10%
6404	DVM1500M	-	-	-	DVM1500M	-	-	-
6411	-	BY229X-800	BY229X-800	BY229X-800	-	BY229X-800	BY229X-800	BY229X-800
6412	-	BY359X-1500	BY359X-1500	BY359X-1500	-	BY359X-1500	BY359X-1500	BY359X-1500
7405	BU4508DX	BU2725DX	BU2725DX	BU2725DX	BU4508DX	BU2725DX	BU4508DX	BU2725DX
9407	JMP	-	-	-	JMP	-	-	JMP
9417	-	JMP	-	-	-	JMP	JMP	JMP

Mono Carrier: Tuner IF



1000 A5
1001 E9
1002 D9
1003 E9
1004 A11
1005 C3
1010 A3
1011 B3
1012 C11
1013 E10
2001 C5
2002 C5
2003 C6
2004 B7
2005 B7
2006 B7
2007 B8
2008 C7
2009 C9
2013 D10
2014 C9
2016 C10
3000 B4
3001 C4
3002 B8
3003 B8
3004 C8
3005 B8
3006 D5
3007 D8
3008 D8
3009 C6
3010 C9
3014 C10
3016 C10
3018 D10
3019 D10
3020 A10
4000 B4
4001 C4
4002 E9
4003 C6
4004 E9
4005 B9
4006 C8
4010 C9
4011 F9
4012 F9
4013 E10
5001 A9
5002 C6
5003 F10
5004 D10
6001 B7
6002 B8
6003 B8
6004 D6
7001 D5
7003 C10
9002 A9
F001 A6
F002 B6
F003 B6
F004 B6
F005 A5
F006 B10
F007 B4
F008 C4
F009 D4
F010 C11
F011 C4
I001 B5
I002 C5
I003 C9
I004 C10
I005 D5
I006 D6
I007 C9
I008 D8
I009 D9
I010 F9
I011 B8
I012 C10
I013 A10
I014 B4
I015 C4
I016 A6
I017 D4

A4 HERCULES

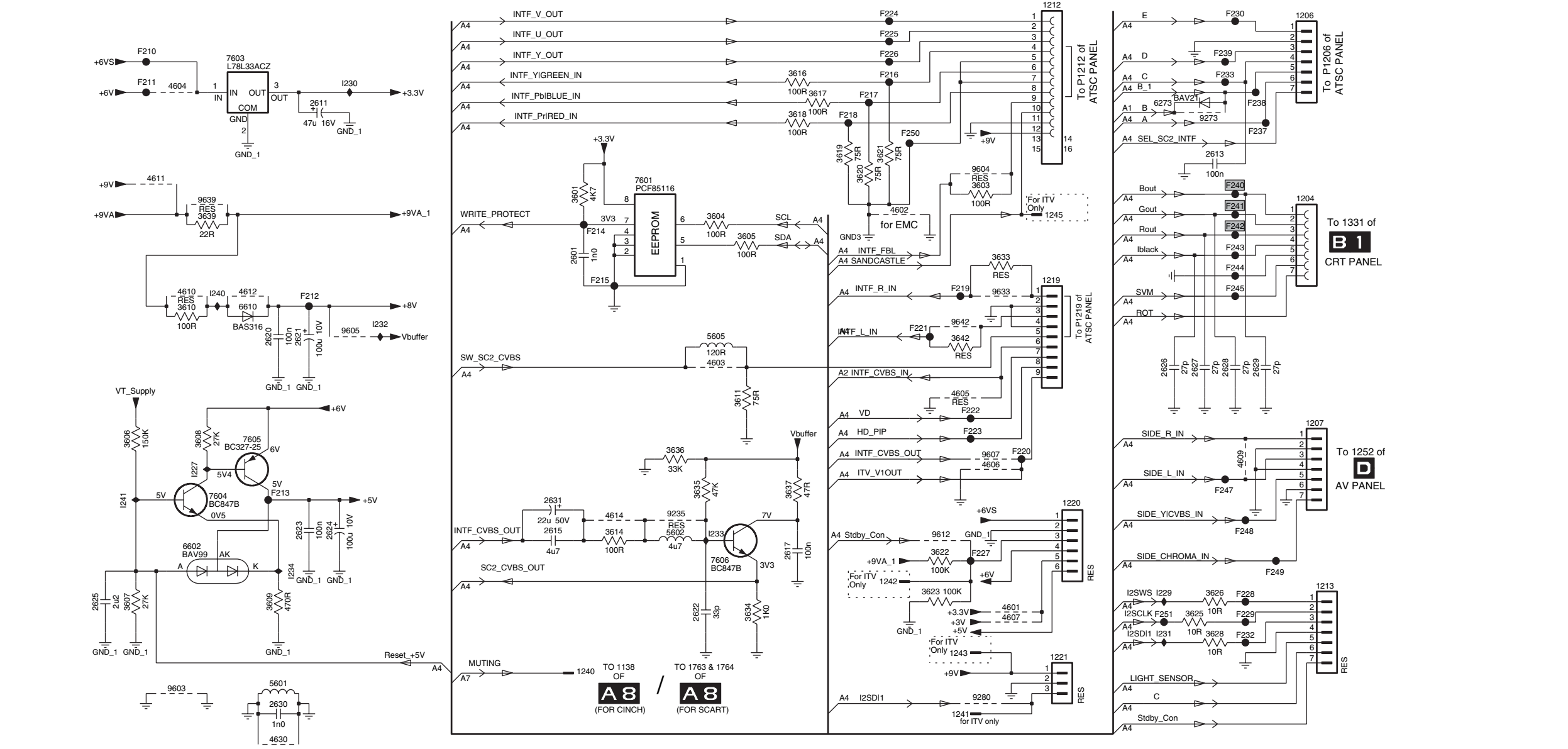


ITEM NO	NAFTA	LATAM	EU	AP
3217	---	---	10K	10K
3293	39K	39K	22K	39K
4213	---	---	JUMP	---
7200	TDA12001H1/N1B50 TDA12001H1/N1B51	TDA12001H1/N1B50 TDA12001H1/N1B10	TDA12020H1/N1B11 TDA12021H1/N1B11	TDA12060H1/N1B TDA12020H1/N1B TDA12021H1/N1B TDA12021H1/N1B
7202	---	---	PDTC114ET	PDTC114ET
7208	BC847B	BC847B	---	BC847B

A	1205 E9	2290 F9	3291 B2	I211 E5
	1208 B3	3200 B3	3292 A8	I212 F7
	1230 B8	3201 B10	3293 A8	I213 F6
	1234 B8	3202 B7	3294 A9	I214 F6
	1235 A4	3203 E10	3295 G6	I215 E6
	1682 B1	3204 B7	3296 F10	I216 B8
	1683 G2	3205 D10	3297 G6	I217 A10
	1684 F1	3206 F10	3298 B8	I218 C1
	2203 F2	3207 B7	3299 B3	I219 B2
	2204 E10	3208 E11	4207 B1	I222 C10
B	2205 D3	3209 E11	4209 G2	I224 F12
	2206 F2	3210 E12	4210 H4	I225 F12
	2207 H2	3211 E11	4211 B10	I226 F2
	2208 H2	3212 B8	4212 H1	I228 B10
	2209 C3	3213 B3	4213 A8	I235 C10
	2210 D2	3214 B7	4214 A10	I236 C10
	2211 E2	3215 B6	4215 B2	C200 F7
	2212 E2	3216 B6	4219 B7	C201 H5
	2213 E3	3217 D10	5201 F2	C202 H5
	2214 E9	3218 B7	5202 C3	C203 H6
C	2215 D3	3219 B7	5203 D2	C204 H6
	2216 E3	3220 E2	5205 D3	C205 H5
	2217 E10	3221 A4	5206 E3	C206 H6
	2218 F7	3222 A4	5207 D3	C207 H6
	2221 A6	3223 B6	5208 C3	C208 H7
	2222 B8	3224 G6	5209 C3	C209 H7
	2223 F7	3225 F9	5210 D2	C210 H5
	2224 D2	3226 B5	5211 E1	C211 H6
	2225 E3	3227 C5	5212 C2	
	2226 F9	3228 B5	5213 G8	
D	2227 F10	3229 E3	5214 E10	
	2229 G7	3230 F7	5215 E2	
	2230 F5	3231 F6	5216 E2	
	2231 F3	3232 F6	5217 B5	
	2232 F3	3233 B10	5218 H4	
	2233 C3	3234 A10	5219 E9	
	2234 C3	3235 A9	5295 F2	
	2235 F6	3236 B5	6201 E11	
	2236 G6	3237 A8	6202 B10	
	2237 F3	3238 B2	6203 E2	
E	2238 C3	3239 B2	6204 D1	
	2239 F6	3240 B2	6205 B10	
	2240 G6	3241 F7	6207 B10	
	2241 F6	3242 B9	6208 G7	
	2242 F8	3243 G6	6209 A7	
	2243 F8	3244 G6	6210 B7	
	2244 F5	3245 B9	6211 B7	
	2245 B9	3246 A9	7200 D6	
	2246 F8	3247 F6	7201-1 E10	
	2247 F8	3248 B4	7201-2 E11	
F	2248 B8	3249 B3	7202 D10	
	2249 D2	3250 B2	7203 E11	
	2250 D2	3251 G6	7204 E11	
	2251 F8	3252 B8	7205 B9	
	2252 B8	3253 C6	7207 B1	
	2253 B4	3254 E2	7208 A8	
	2254 F6	3255 A4	7209 F10	
	2255 G4	3256 B4	7210 F11	
	2256 F5	3257 B4	9201 B5	
	2257 B8	3258 B3	9202 H3	
G	2258 F9	3259 B9	9203 H4	
	2259 B9	3260 B6	9204 B6	
	2260 G5	3261 B6	9205 H3	
	2261 F5	3262 C10	9211 A3	
	2262 F3	3263 C10	9212 B3	
	2263 F6	3264 C10	9215 G5	
	2264 F3	3265 D10	9257 G4	
	2265 C2	3266 D10	9260 B5	
	2266 F7	3267 B5	9261 G3	
	2267 E4	3268 B5	9262 G5	
H	2268 F9	3269 B6	9265 G3	
	2269 F9	3270 G3	9266 G3	
	2270 B4	3271 A8	F200 E11	
	2271 B5	3272 B2	F201 D3	
	2272 E2	3273 B1	F202 C9	
	2273 E1	3274 G5	F203 F2	
	2274 F6	3275 G5	F204 F7	
	2275 F6	3276 G3	F205 B6	
	2276 C2	3277 G3	F206 B2	
	2277 D11	3278 G3	F207 D3	
I	2278 F8	3279 C10	F208 B2	
	2279 B6	3280 C10	F209 F12	
	2280 B6	3281 B10	F270 C10	
	2281 F2	3282 C10	I201 E11	
	2282 C9	3283 C10	I203 E8	
	2283 G5	3284 B7	I204 F10	
	2284 F4	3285 D10	I205 G6	
	2285 G5	3286 B3	I206 G6	
	2286 F3	3287 B9	I207 A8	
	2287 G5	3288 G2	I208 A9	
J	2288 A3	3289 C5	I209 B10	
	2289 B4	3290 A10	I210 C3	

Mono Carrier: Features & Connectivity

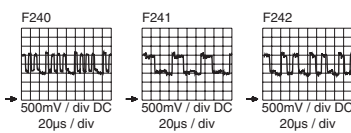
A5 FEATURES & CONNECTIVITIES



1213	MTV	ITV
1	I2SWS	ITV DATA OUT/SDA
2	I2SCLK	ITV DATAIN
3	I2SDI1	ITV CLOCK
4	GND	GND
5	Light sensor	ITV SCL
6	C	ITV POR 1
7	Stdb-con	Stdb-con

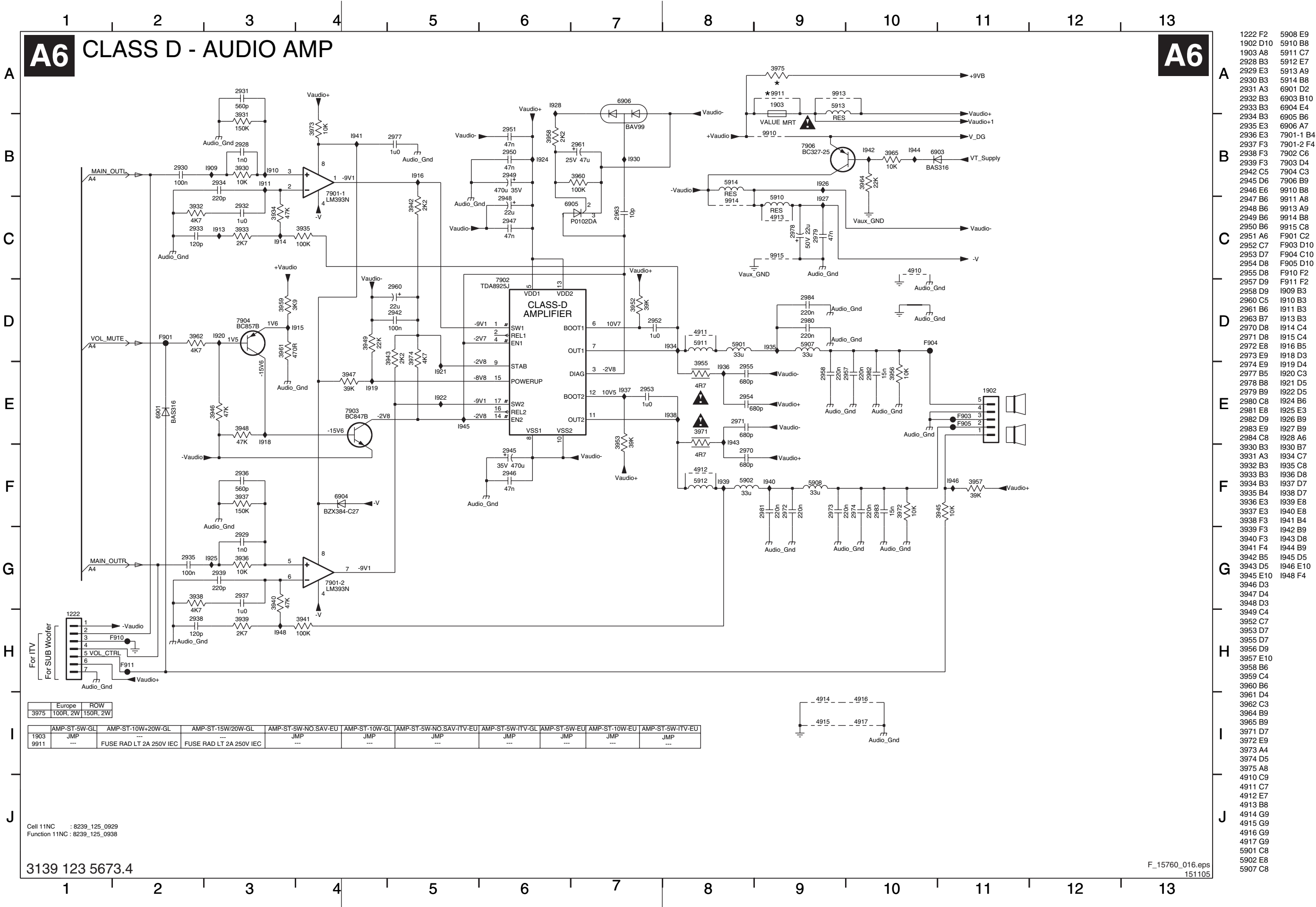
1206	DVD	iDTV	USB	PCMCIA	ATSC
A	-	-	-	-	-
B	Power On	Power On	Power On	Power On	Power On
C	Bus Request	Bus Request	Bus Request	Bus Request	Reset #
D	Rx	-	Rx	Rx	Rx
E	Tx	-	Tx	Tx	Tx

1212	ATSC
1	-
2	-
3	-
4	-
5	GND
6	Y
7	U
8	V
9	-
10	-
11	-
12	-



- 1204 C10
- 1206 A10
- 1207 D10
- 1212 A9
- 1213 E11
- 1219 C9
- 1220 E9
- 1221 F9
- 1240 F5
- 1241 F8
- 1242 E7
- 1243 F8
- 1245 C9
- 2601 C5
- 2611 B3
- 2613 B10
- 2615 E5
- 2617 E7
- 2620 D3
- 2621 D3
- 2622 E6
- 2623 E3
- 2624 E4
- 2625 E2
- 2626 D9
- 2627 D10
- 2628 D10
- 2629 D10
- 2630 F3
- 2631 E5
- 3601 C5
- 3603 B8
- 3604 C6
- 3605 C6
- 3606 D2
- 3607 E2
- 3608 D3
- 3609 E3
- 3610 C3
- 3611 D6
- 3614 E6
- 3616 B7
- 3617 B7
- 3619 B7
- 3620 B7
- 3621 B7
- 3622 E8
- 3623 E8
- 3625 E10
- 3626 E10
- 3628 F10
- 3633 C8
- 3634 E6
- 3635 E6
- 3636 D6
- 3637 E7
- 3639 C3
- 3642 D8
- 4601 E8
- 4602 C8
- 4603 D6
- 4604 B2
- 4605 D8
- 4606 D8
- 4607 F8
- 4609 D10
- 4610 C3
- 4611 B2
- 4612 C3
- 4614 E6
- 4630 F3
- 5601 F3
- 5602 E6
- 5605 D6
- 6273 B9
- 6602 E3
- 6610 C3
- 7601 B6
- 7603 B3
- 7604 E3
- 7605 D3
- 7606 E6
- 9235 E6
- 9273 B10
- 9280 F8
- 9603 F2
- 9604 B8
- 9605 D4
- 9607 D8
- 9612 E8
- 9633 C8
- 9639 C3
- 9642 C8
- F210 B2
- F211 B2
- F212 C3
- F213 E3
- F214 C5
- F215 C5
- F216 B7
- F217 B7
- F218 B7
- F219 C8
- F220 D8
- F221 C8
- F222 D8
- F223 D8
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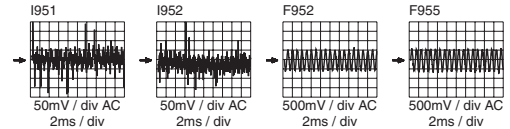
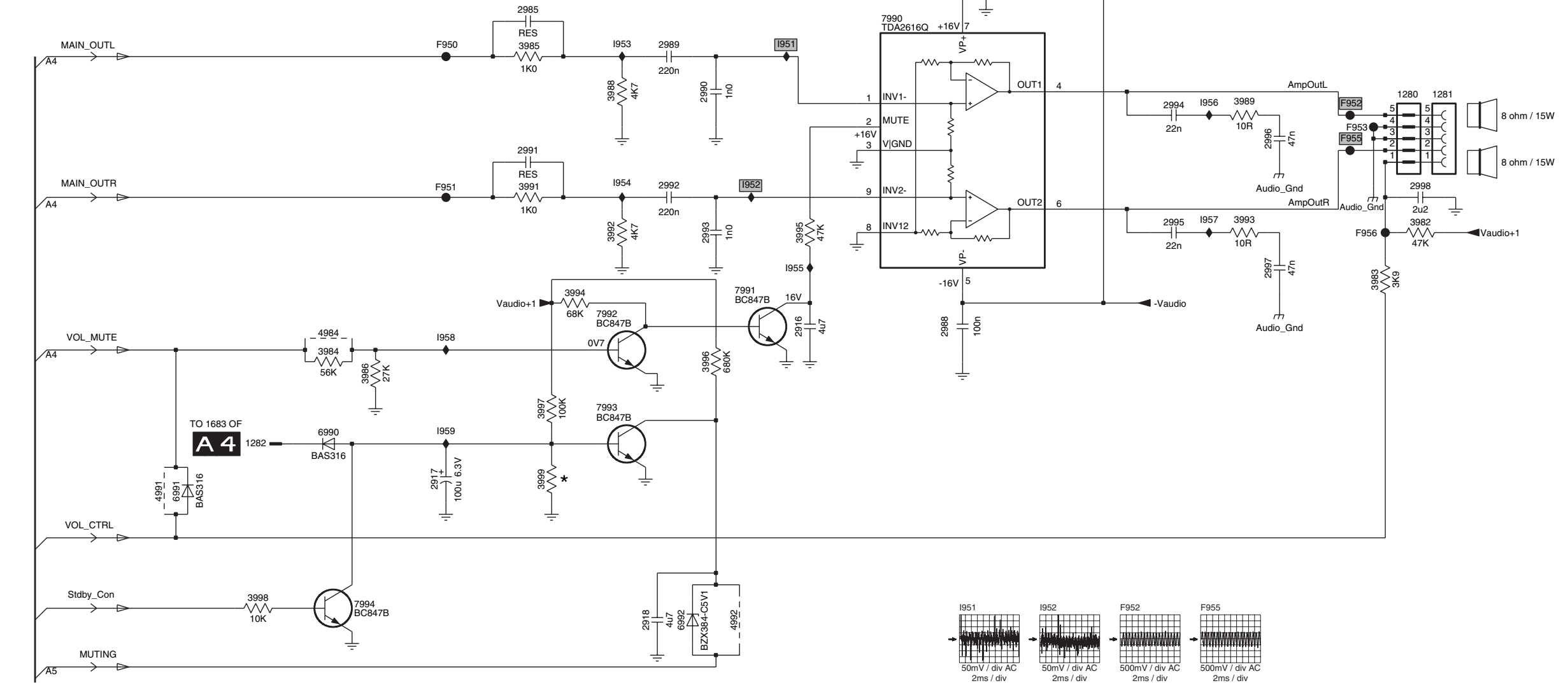
Mono Carrier: Class D - Audio Amplifier



Mono Carrier: Audio Amplifier

A7 AUDIO AMPLIFIER

A7



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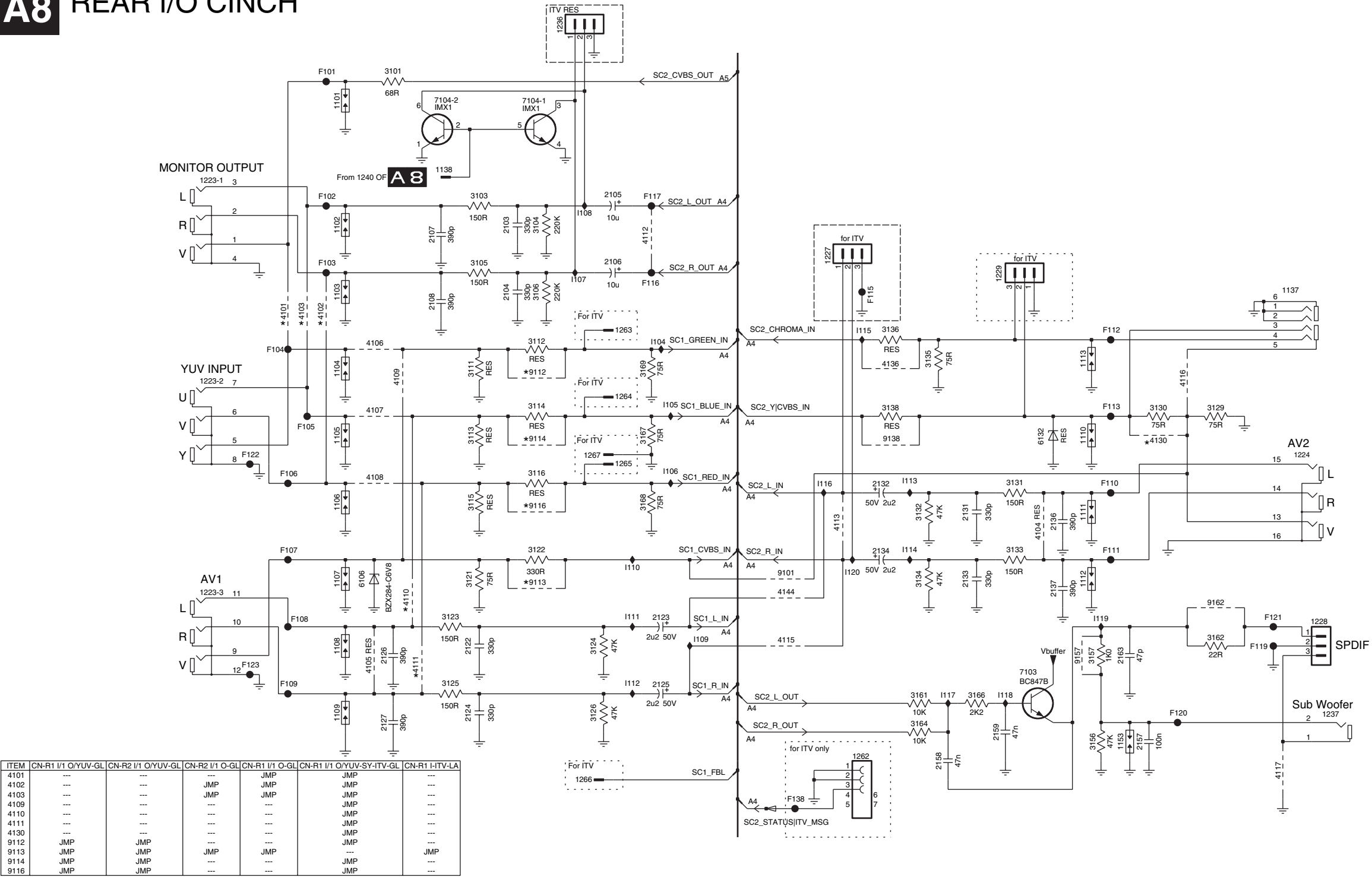
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- F956 C9
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- I952 B5
- I953 A4
- I954 B4
- I955 C5
- I956 B8
- I957 B8
- I958 C3
- I959 D3

Mono Carrier: Rear I/O Cinch

A8 REAR I/O CINCH

A8



ITEM	CN-R1 I/1 O/YUV-GL	CN-R2 I/1 O/YUV-GL	CN-R2 I/1 O-GL	CN-R1 I/1 O-GL	CN-R1 I/1 O/YUV-SY-ITV-GL	CN-R1 I-ITV-LA
4101	---	---	---	JMP	JMP	---
4102	---	---	---	JMP	JMP	---
4103	---	---	---	JMP	JMP	---
4109	---	---	---	---	---	---
4110	---	---	---	---	---	---
4111	---	---	---	---	---	---
4130	---	---	---	---	---	---
9112	JMP	JMP	---	---	JMP	---
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9114	JMP	JMP	---	---	JMP	---
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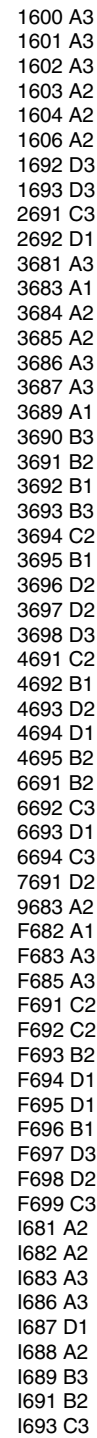
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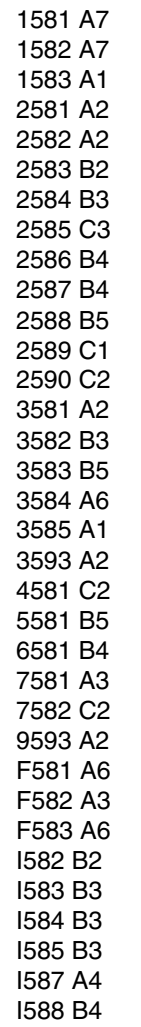
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- 1110 D9
- 1111 E9
- 1112 E9
- 1113 C9
- 1137 C1
- 1138 B5
- 1153 F0
- 1223-1 B3
- 1223-2 D3
- 1223-3 E3
- 1227 C7
- 1228 E1
- 1229 C9
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- 1266 G6
- 1267 D6
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- 2106 C6
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- 2123 E6
- 2124 F5
- 2125 F6
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- 2127 F4
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- 2136 E9
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- 3123 E5
- 3124 F6
- 3125 F5
- 3126 F6
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- 3132 E8
- 3133 E9
- 3134 E8
- 3135 C8
- 3136 C8
- 3138 D8
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- 3157 F9
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- 4102 C4
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- F110 D9
- F111 E9
- F112 C9
- F113 D9
- F115 C8
- F116 C6
- F117 B6
- F119 F11
- F120 F10
- F121 E11
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- F123 F3
- F138 G7
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- I105 D6
- I106 D6
- I107 C5
- I108 B6
- I109 E6
- I110 E6
- I111 E6
- I112 F6
- I113 D8
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- I116 D7
- I117 F8
- I118 F9
- I119 E9
- I120 E8

A9 FRONT CONTROL

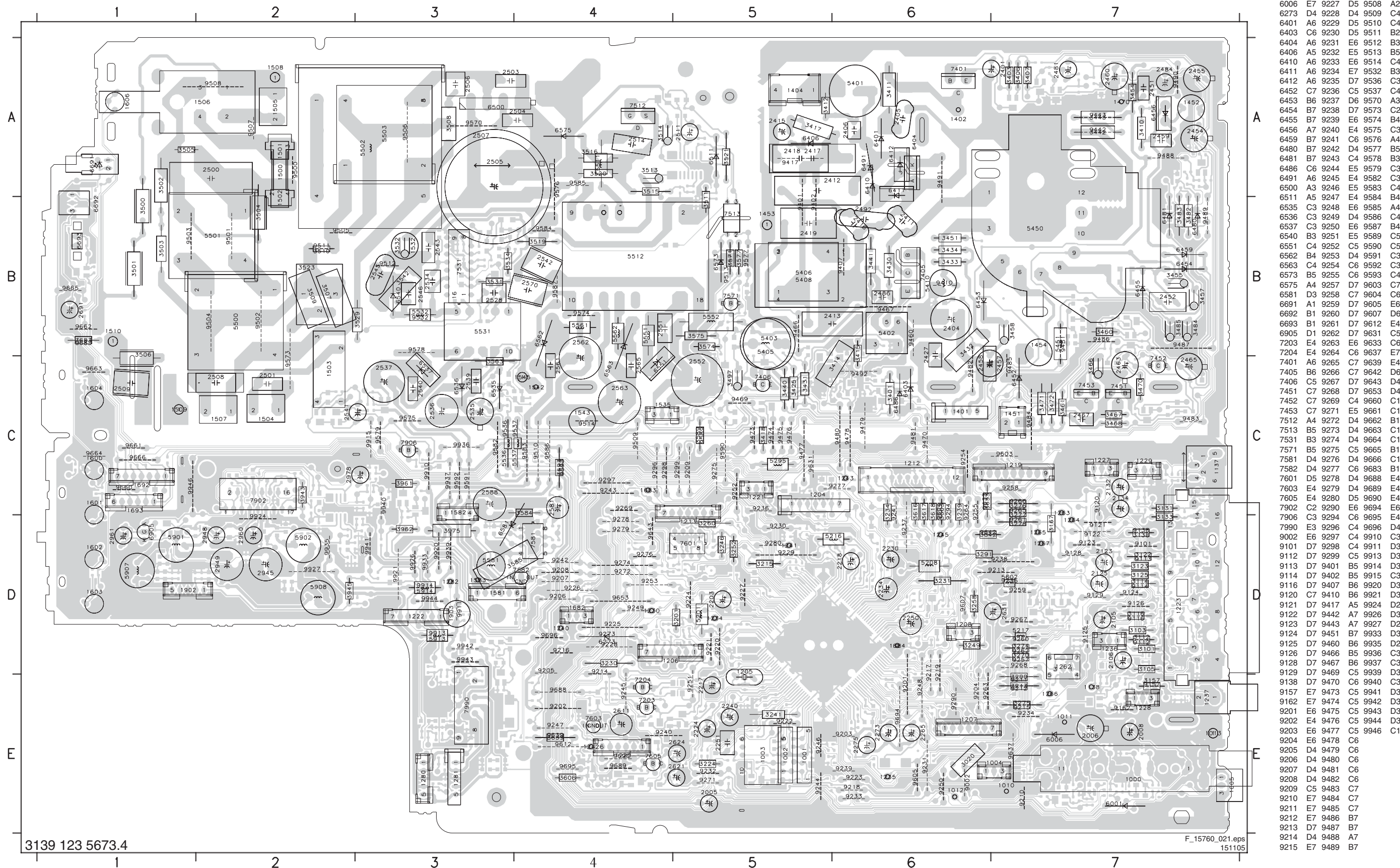
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E_06532_012.eps
131004

A10 DVD POWER SUPPLY (OPTIONAL)

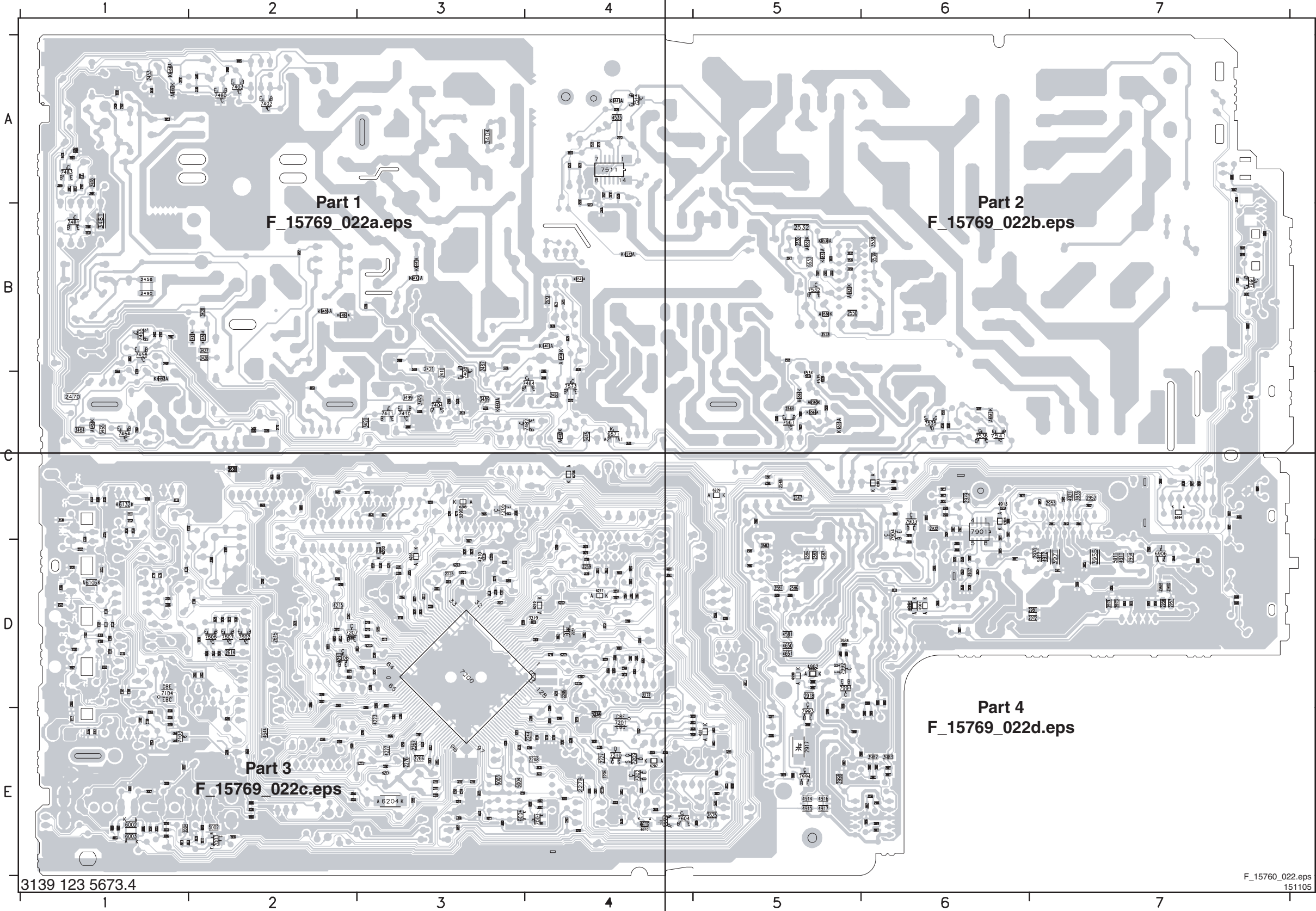


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1001	E5	1204	C5	1223	D7	1243	C6	1401	C6	1503	C2	1543	C4	1682	D4	2106	D7	2234	E5	2412	B6	2455	A7	2492	B6	2511	A5	2543	B3	2588	C3	2978	C2	3131	D7	3231	D6	3275	E7	3412	A6	3440	C5	3466	C7	3500	B1	3511	B5	3532	B3	3593	C4	3945	D2	5403	B6	5511	A4	5562	B4	9217	D6	9491	A6
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Layout Mono Carrier (Overview Bottom Side)

2001	E1	2107	D1	2158	E1	2212	D4	2229	D3	2243	D3	2256	D3	2268	E4	2281	D4	2403	A1	2461	B1	2489	B3	2531	B5	2566	C5	2590	D5	2627	D3	2931	C6	2947	C7	2971	D7	2985	D6	2996	E6	3008	E2	3115	D1	3161	D1	3207	D4	3220	D3	3235	E4	3250	D2	3264	D4	3281	D4	3293	D2	3694	A7	4437	C2	6451	A1
2002	E1	2108	D1	2159	E1	2213	D3	2231	D3	2244	E4	2257	E3	2269	E4	2282	D4	2408	C3	2462	B1	2490	B1	2532	B5	2571	B4	2601	D4	2628	D3	2932	C6	2950	D7	2972	D7	2986	E5	2997	E6	3009	E3	3121	D1	3162	E1	3208	E4	3221	D3	3236	E4	3251	E3	3265	D4	3282	D4	3294	C3	3695	B7	4470	A1	6457	C1
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2007	E1	2126	D1	2205	D4	2216	D3	2235	E4	2247	D2	2260	E2	2272	E3	2285	E3	2414	C3	2469	B1	2513	A4	2544	B5	2582	C5	2615	D2	2692	B7	2935	D6	2953	C7	2977	C6	2989	D6	3001	E1	3016	E1	3129	C1	3168	D2	3211	E4	3225	D3	3240	D2	3255	E2	3268	D2	3285	E4	3297	E3	3698	C7	4492	A1	6483	B2
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3436	B3	3939	D6	4604	E5	6538	B5
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3445	C4	3941	D6	4606	C2	6564	C5
3446	C4	3942	C7	4607	E5	6565	C5
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3453	A1	3947	C6	4610	E5	6571	C4
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3463	B1	3949	C6	4612	E4	6576	C5
3464	C1	3952	C7	4620	C2	6602	E4
3465	C1	3953	C7	4630	C2	6610	E4
3469	C1	3955	D7	4631	D4	6694	C7
3473	A1	3956	D7	4635	C2	6901	D6
3474	C2	3957	D6	4637	D2	6903	C6
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3476	A1	3959	C6	4644	E2	6906	D7
3477	A1	3960	D7	4645	D2	6990	D5
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3481	B1	3971	D7	4649	E5	7001	E4
3486	B1	3972	D7	4650	D5	7003	E2
3487	A2	3973	D6	4651	D5	7103	E1
3488	A2	3974	C6	4691	C7	7104	D1
3489	C3	3982	E6	4692	B7	7200	D3
3490	A1	3983	E6	4693	B7	7201	E4
3491	A1	3984	D5	4694	C7	7202	E4
3492	A1	3985	D6	4695	A7	7205	C3
3493	A1	3986	D5	4696	C7	7207	D2
3494	A1	3988	E6	4910	D6	7208	D2
3495	C3	3989	E6	4911	D7	7209	E4
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3499	C3	3992	E6	4913	C6	7402	A2
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3524	A4	3997	D5	4921	C7	7411	C3
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3573	B4	4013	E3	5209	E4	7536	C6
3576	B4	4015	E1	5210	D3	7541	C6
3578	B4	4101	D1	5211	E3	7561	C5
3579	B4	4102	D1	5212	E3	7573	C4
3581	D5	4103	D1	5213	D3	7602	D2
3582	D5	4104	C1	5214	E4	7604	E4
3583	D5	4105	D1	5215	D4	7606	D2
3601	D4	4106	D1	5218	D3	7607	D2
3604	D4	4107	D1	5219	E4	7691	B7
3605	D4	4108	D1	5513	B4	7901	C6
3607	E5	4109	D1	5533	B5	7903	C6
3608	E4	4110	D1	5534	C5	7904	C6
3609	E5	4111	D1	5535	C5	7991	D5
3610	E5	4112	C1	5601	C2	7992	D5
3614	D2	4113	C1	5910	C6	7993	E5
3619	C3	4115	D1	5911	D7	7994	E5
3620	C3	4116	C1	5912	D7		
3621	C3	4117	E1	6002	E1		
3622	E5	4130	C1	6003	E1		
3623	E5	4136	C1	6004	E3		
3625	D4	4144	D2	6106	D1		
3626	D4	4207	D2	6132	C1		
3628	D4	4209	E3	6201	E5		
3631	D2	4210	D3	6202	D3		
3634	D2	4211	D3	6203	D3		
3635	D2	4212	D3	6204	E3		
3636	D2	4213	D2	6205	C3		
3637	D2	4214	C3	6207	E4		
3681	C7	4215	D2	6208	C4		
3684	C7	4219	D4	6209	C5		
3685	D7	4221	D3	6210	D4		
3686	D7	4222	E4	6211	D4		
3687	C7	4223	E3	6407	B4		
3689	C7	4224	E3	6408	B4		
3690	C7	4226	E3	6441	B3		
3691	A7	4227	E3	6442	B3		
3692	A7	4240	C5	6443	C3		
3693	B7	4241	C5	6450	A1		

3139 123 5673.4

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151105

4



7

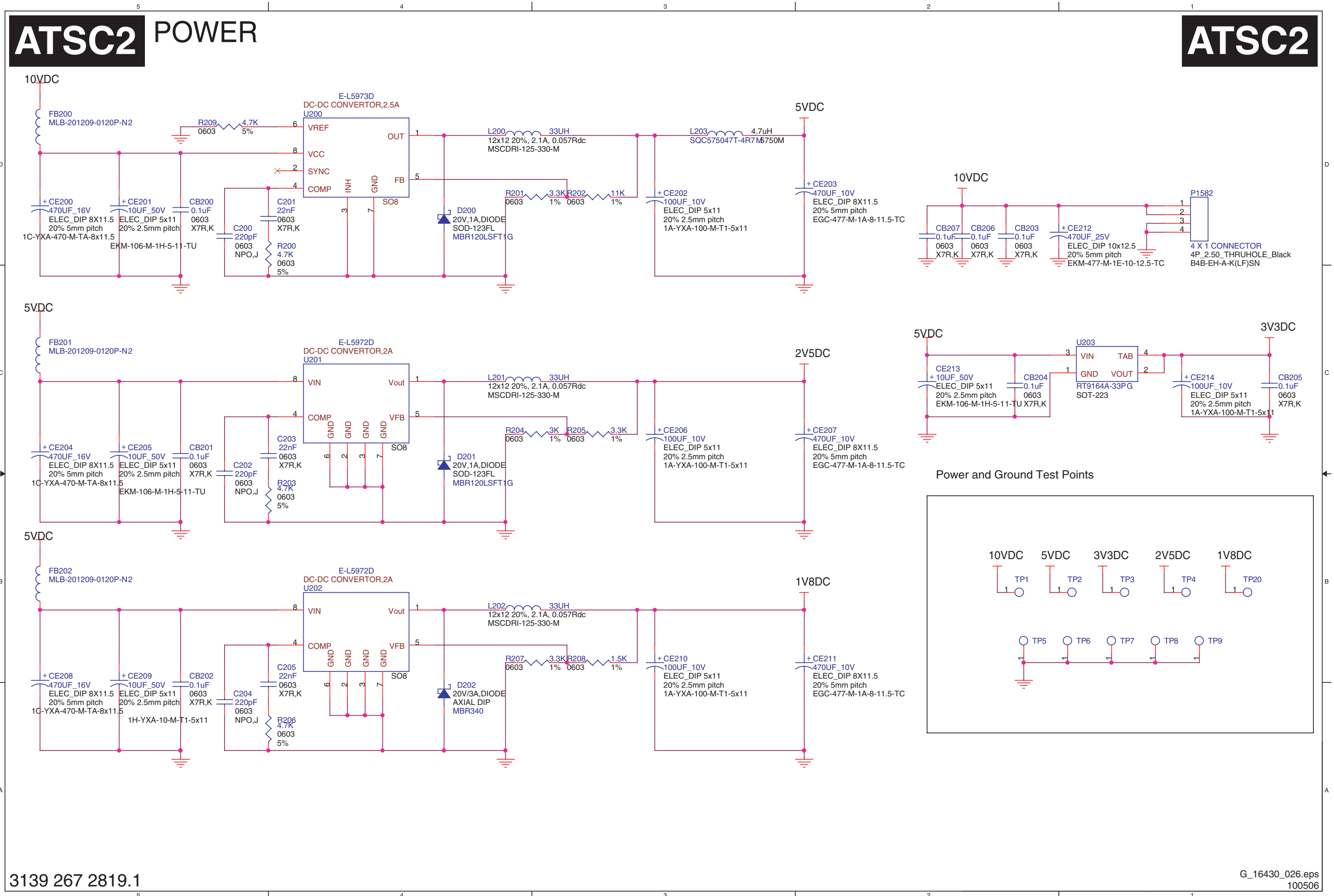


E



E

ATSC Panel: Power



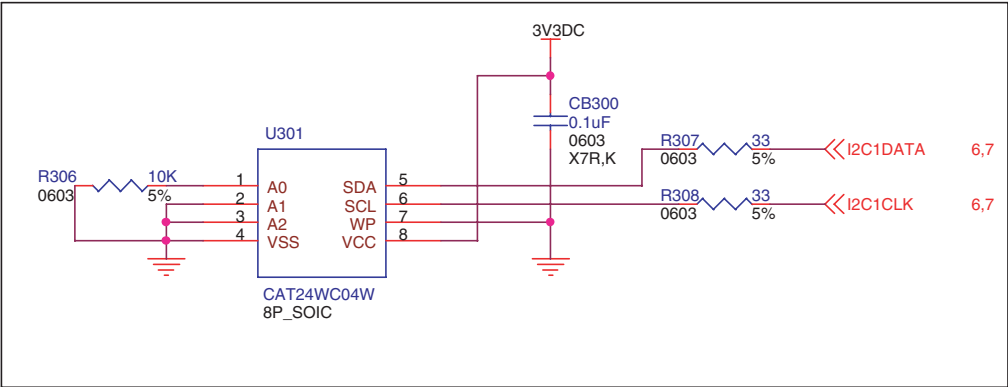
ATSC Panel: Reset, Pads, Spade Lug, I2C EEPROM

ATSC3

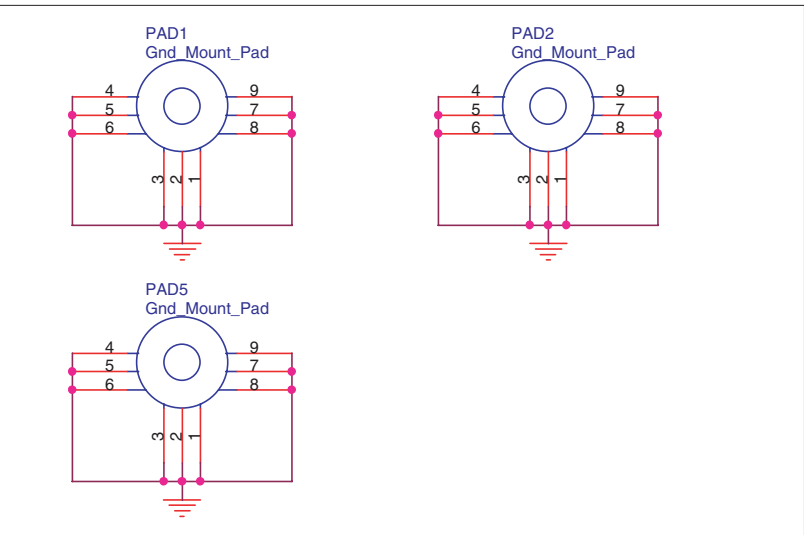
RESET, PADS, SPADE LUG, I2C EEP-ROM

ATSC3

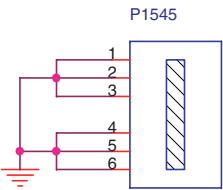
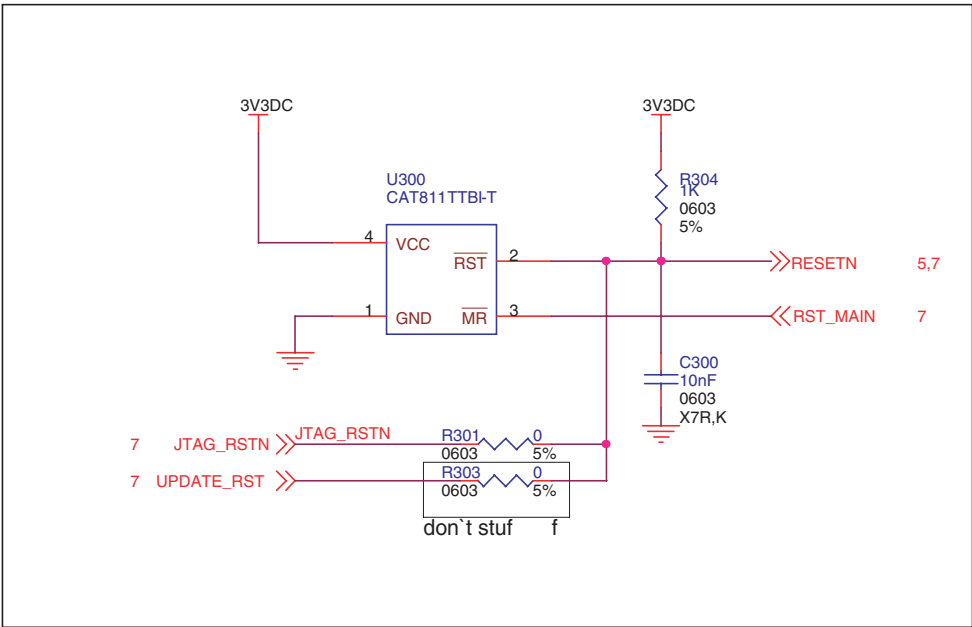
I2C EEP-ROM



Grounded Mounting Holes, PCB

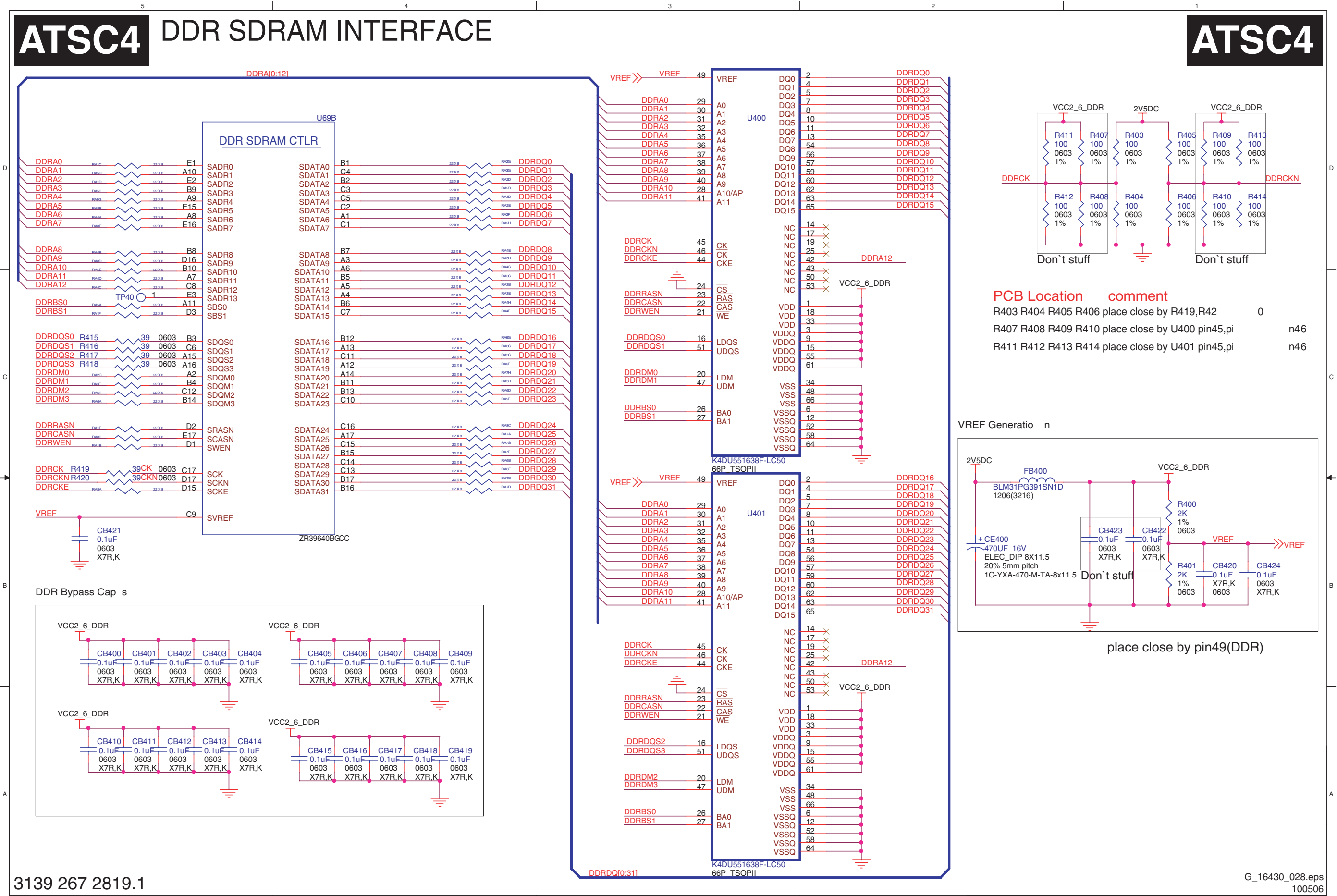


Reset Circuit

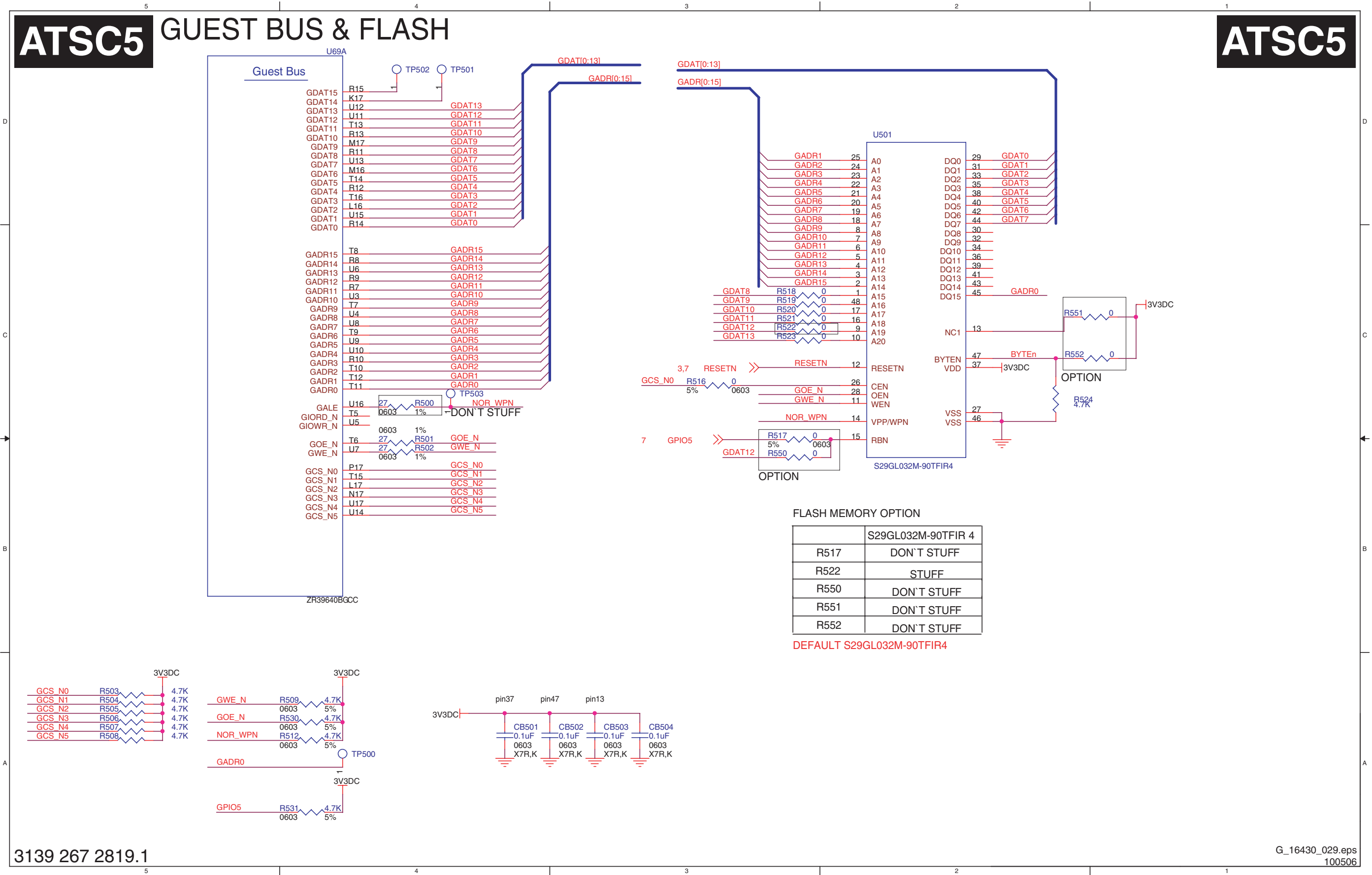


1 X 1 CONNECTOR
SL_THRUHOLE
0-10645-1
SPADE LUG
AMP

ATSC Panel: DDR SDRAM Interface

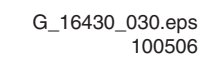


ATSC Panel: Guest Bus & Flash

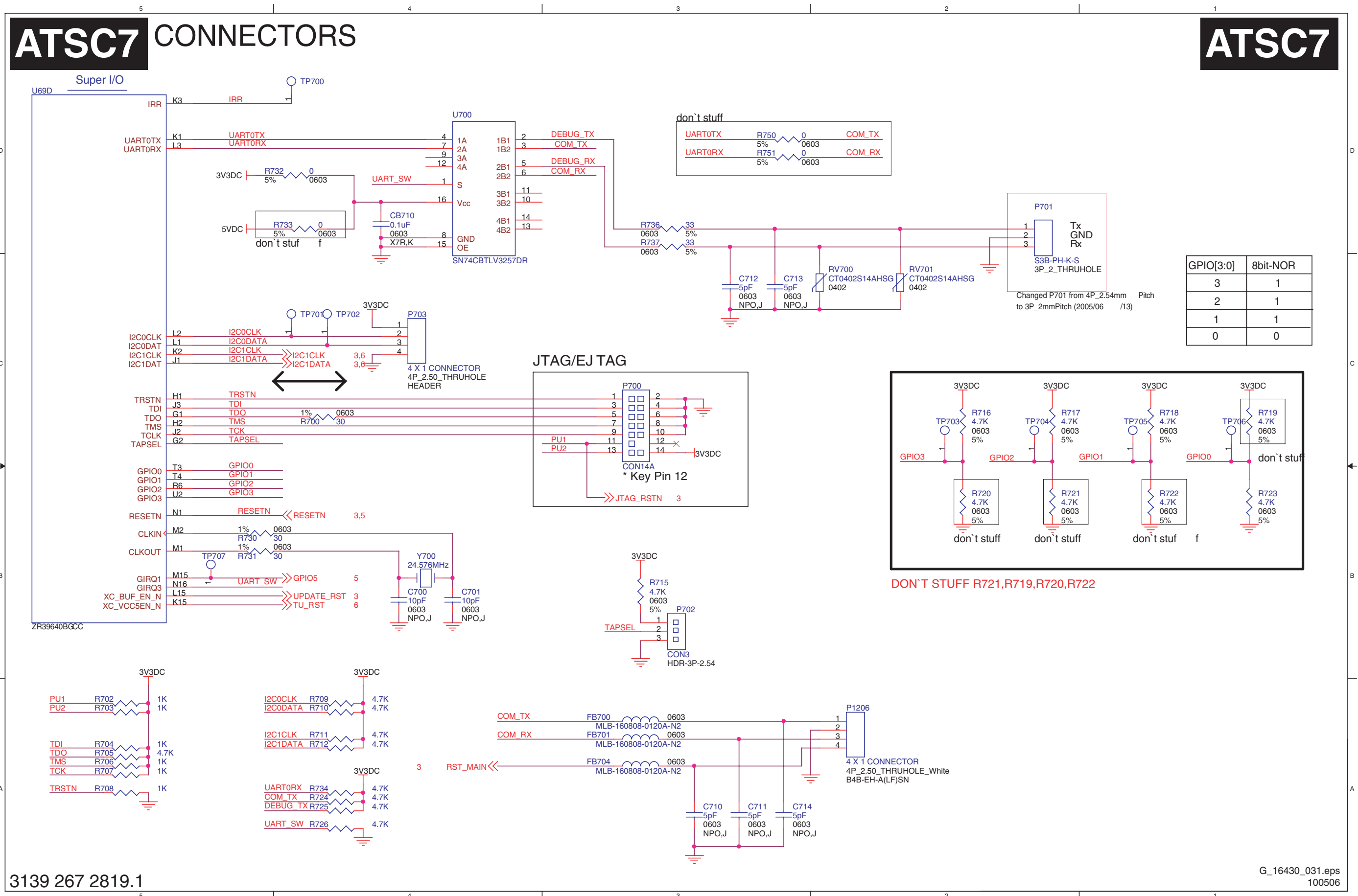


ATSC6 TUNER & OREN CASCADE DEMODULATOR

ATSC6



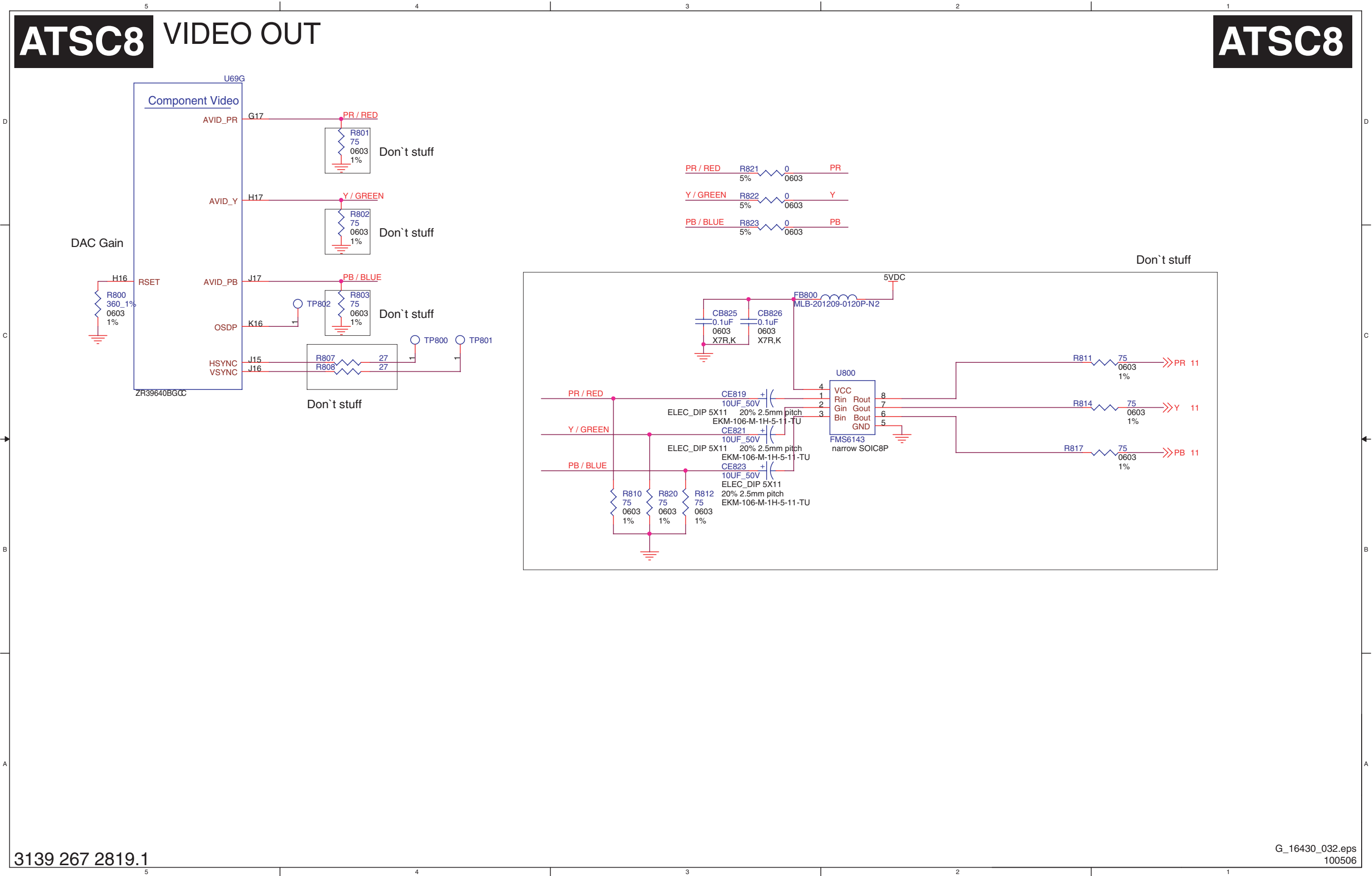
ATSC Panel: Connectors



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100506

ATSC Panel: Video Out



ATSC9 AUDIO OUTPUT

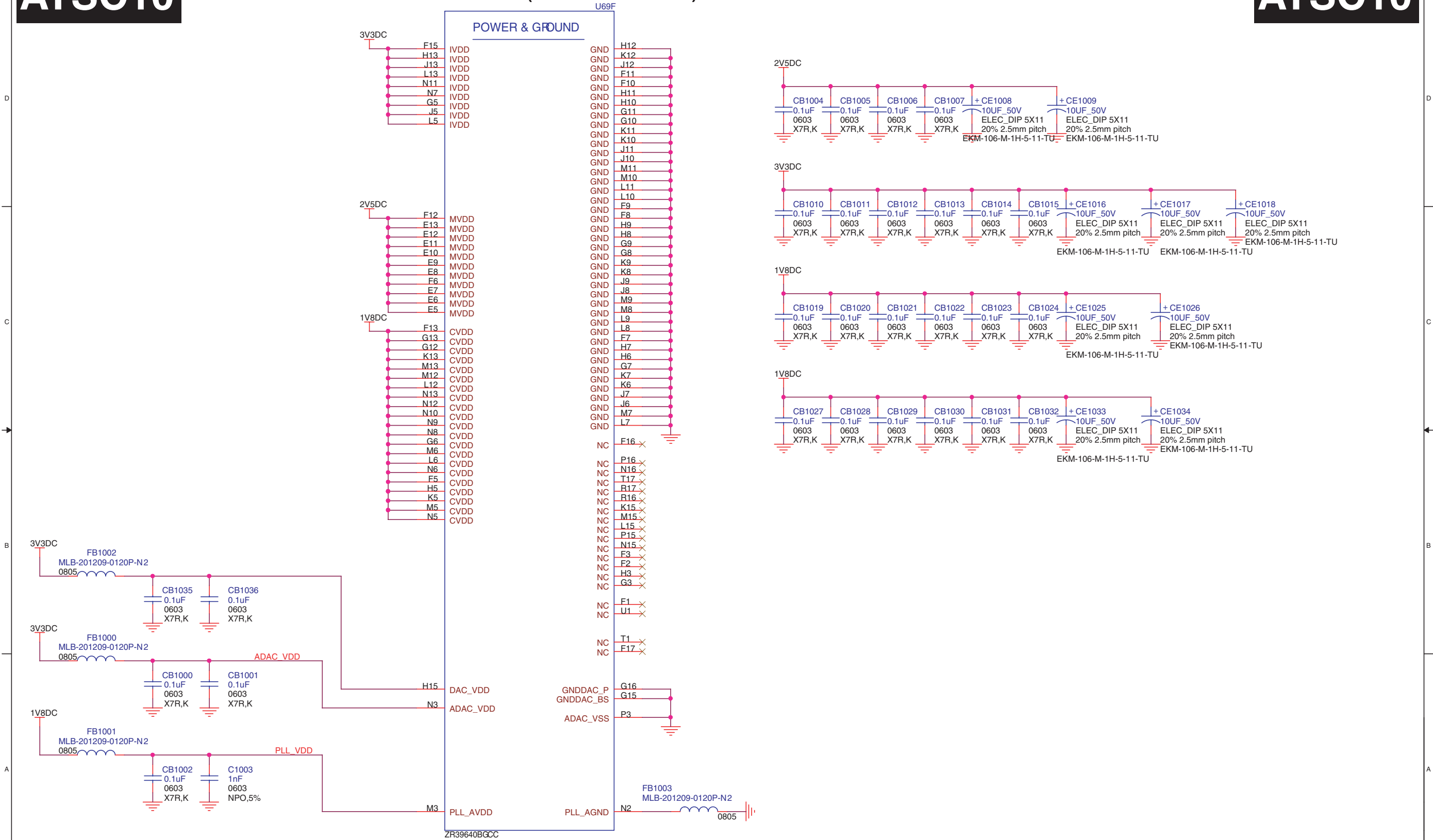


ATSC Panel: Power & Gnd

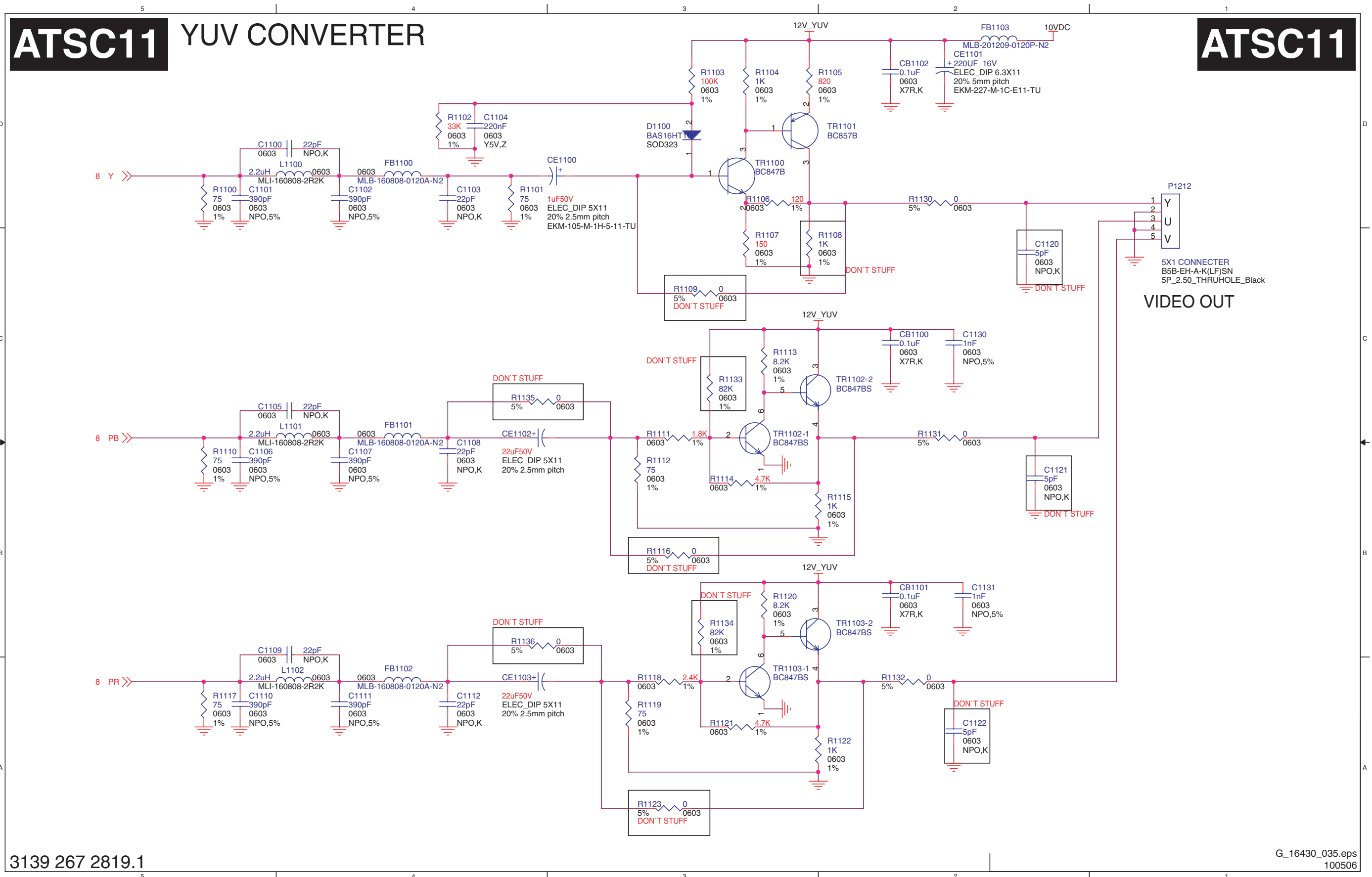
ATSC10

POWER AND GROUND (ATV & DDR)

ATSC10



ATSC Panel: YUV Converter



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100506

G_16430_025.eps
100506

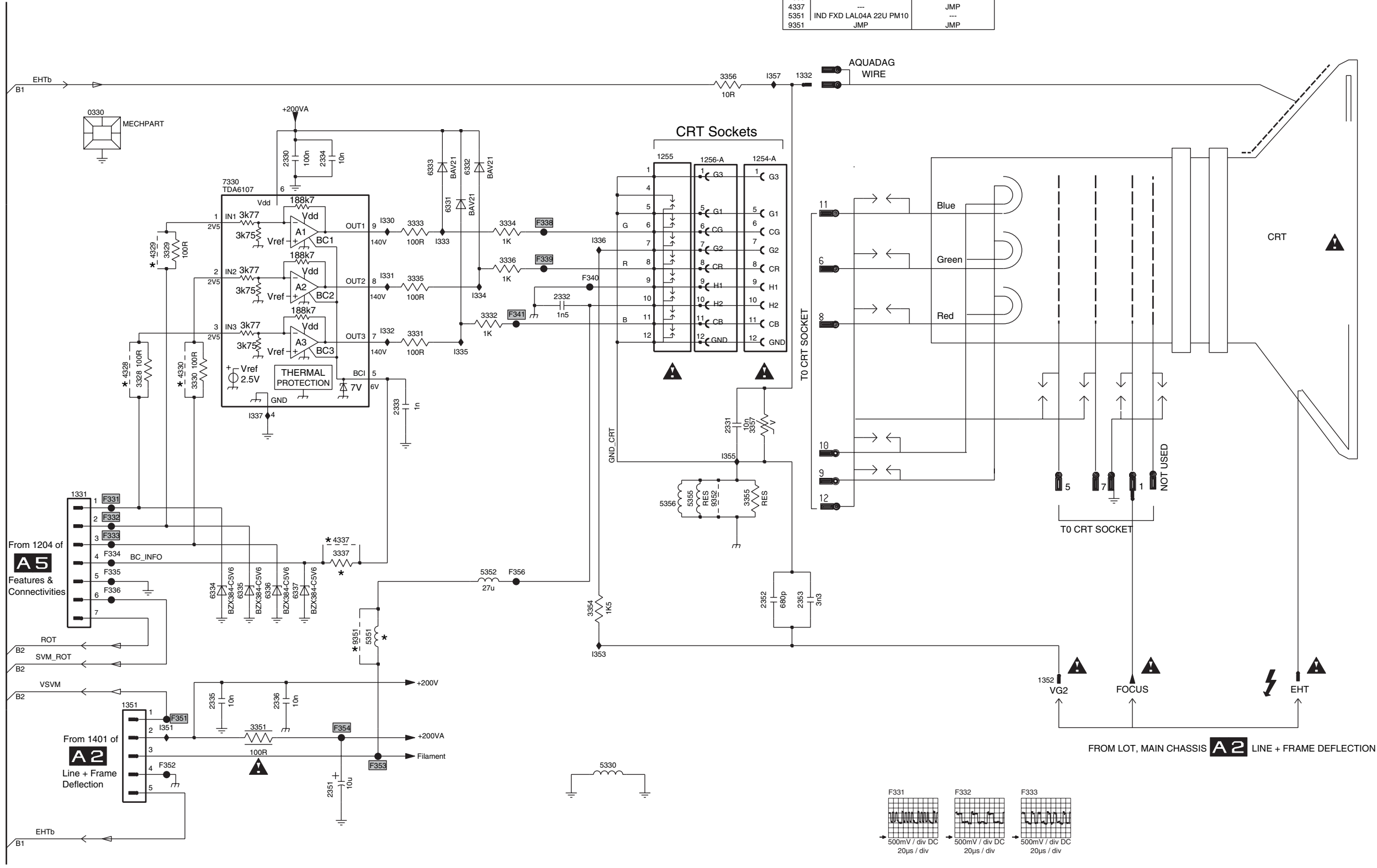
CRT Panel

B1 CRT PANEL

ITEM	ROW	
	THE REST	RGB+DISPL-29FS_IN
3328	100R	100R
3329	100R	100R
3330	100R	100R
3337	---	---
4328	---	---
4329	---	---
4330	---	---
4337	---	JMP
5351	IND FXD LAL04A 22U PM10	---
9351	JMP	JMP

B1

0330 B2
1254-A B7
1255 B6
1256-A B7
1331 E2
1332 B8
1351 G2
1352 G9
2330 B3
2331 E7
2332 D6
2333 D4
2334 B4
2335 G3
2336 G3
2351 G4
2352 F7
2353 F7
3328 D2
3329 C3
3330 D3
3331 D4
3332 D5
3333 C4
3334 C5
3335 C4
3336 C5
3337 F4
3351 G3
3354 F6
3355 E7
3356 B7
3357 E7
4328 D2
4329 C2
4330 D3
4337 E4
5330 G6
5351 F4
5352 F5
5355 E7
5356 E6
6331 C5
6332 C5
6333 C5
6334 F3
6335 F3
6336 F3
6337 F4
7330 C3
9351 F4
9352 E7
F331 E2
F332 E2
F333 E2
F334 F2
F335 F2
F336 F2
F338 C5
F339 C5
F340 C6
F341 D5
F351 G3
F352 G3
F353 G4
F354 G4
F356 F5
I330 C4
I331 C4
I332 D4
I333 C5
I334 D5
I335 D5
I336 C6
I337 D3
I351 G3
I353 F6
I355 E7
I357 B7



FAMILY BOARD 11 NC : 3139_123_5672
CRT BOARD 11 NC : 3139_123_5674

3139 123 5674.3

F_15760_023.eps
171105

CRT Panel: Eco Scavem

B2 ECO SCAVEM

B2

- 0316 A6
- 1361 B7
- 1381 D7
- 1382 A5
- 2361 A4
- 2362 A4
- 2363 A4
- 2364 A4
- 2365 B4
- 2367 B6
- 2368 A4
- 2376 B2
- 2381 D3
- 2382 E6
- 2383 E6
- 2384 A5
- 2385 C5
- 2386 E3
- 2387 C3
- 3361 A3
- 3362 B3
- 3363 A5
- 3364 A5
- 3365 A5
- 3366 B5
- 3367 B5
- 3368 C5
- 3369 B5
- 3370 C5
- 3371 B6
- 3373 A2
- 3374 E5
- 3375 A3
- 3376 A3
- 3381 D4
- 3383 D4
- 3384 E4
- 3385 E5
- 3386 E5
- 3387 A3
- 3388 A4
- 3389 B4
- 3390 D3
- 4374 E5
- 5331 C2
- 5361 A6
- 6361 B3
- 6362 B3
- 6376 B2
- 6381 D5
- 6383 C3
- 7331 D3
- 7332 D3
- 7361 A3
- 7362 C3
- 7363 A6
- 7364 C6
- 7366 D6
- 7376 A2
- 7381 D5
- 7382 E5
- 9361 B6
- F360 C2
- F361 A6
- F362 B6
- F381 E7
- F382 E7
- I360 A5
- I361 A3
- I362 B3
- I363 C4
- I364 C3
- I365 B5
- I366 A5
- I367 A5
- I368 A6
- I369 B5
- I370 A4
- I371 B5
- I372 C6
- I373 A3
- I374 A2
- I375 B2
- I381 C3
- I383 D4
- I384 E4
- I385 E5
- I386 C2
- I387 D3

A

A

B

B

C

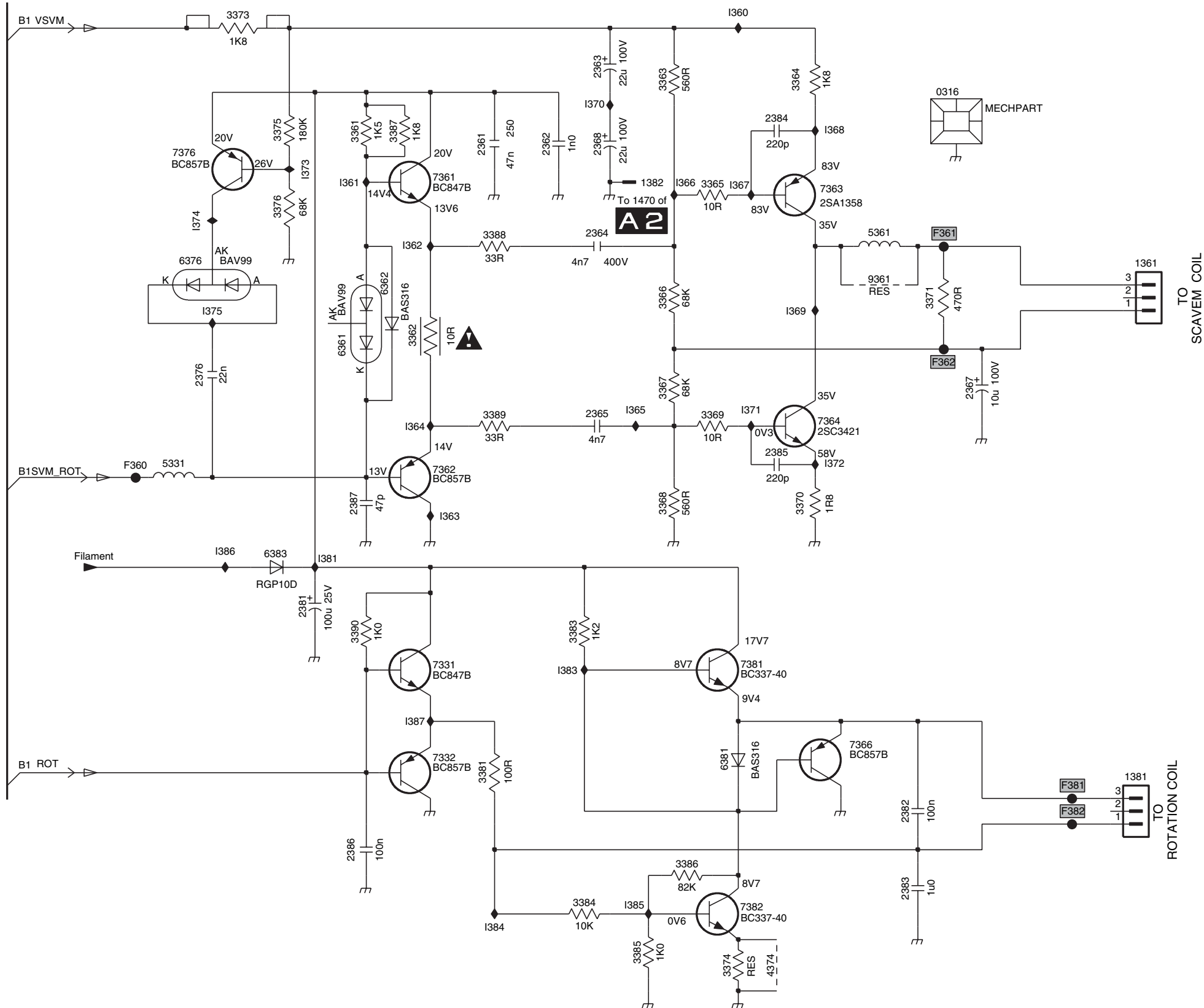
C

D

D

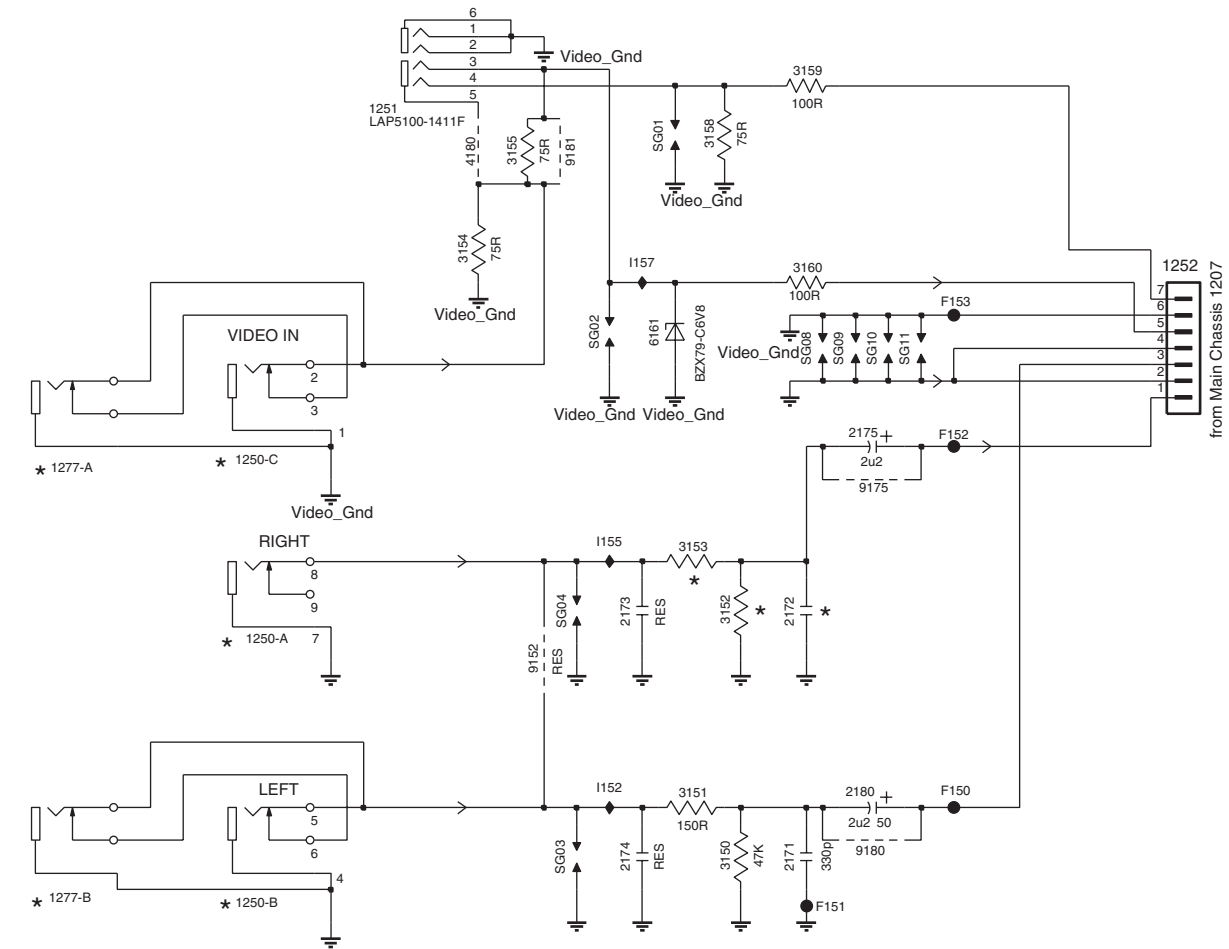
E

E

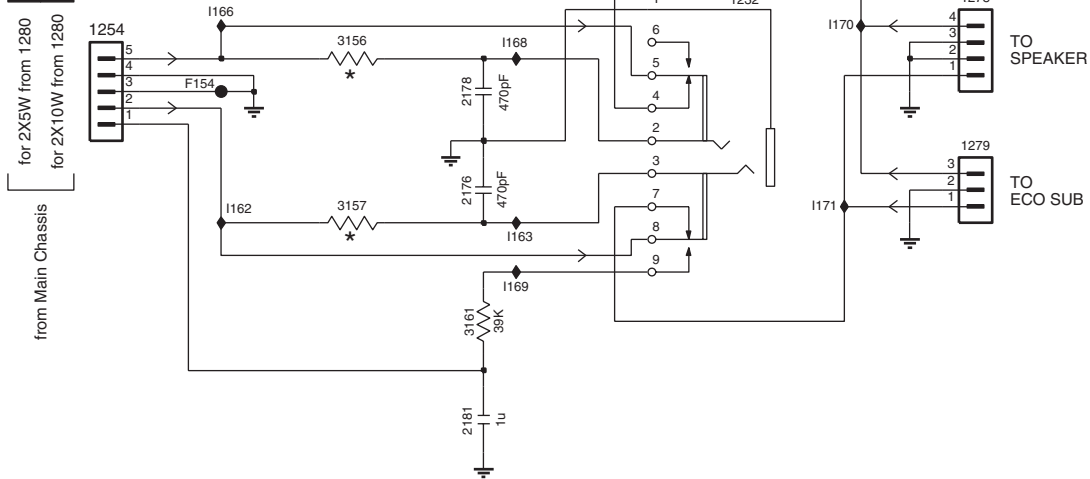


Side AV + Headphone Panel

D SIDE AV PANEL + HP PANEL



A 7 A 6



- 1232 B10
- 1250-A D2
- 1250-B E2
- 1250-C C2
- 1251 B3
- 1252 B6
- 1254 B7
- 1277-A C2
- 1277-B E2
- 1278 B11
- 1279 C11
- 2171 E5
- 2172 D5
- 2173 D4
- 2174 E4
- 2175 C5
- 2176 C9
- 2178 B9
- 2180 E5
- 2181 D9
- 3150 E4
- 3151 E4
- 3152 D4
- 3153 C4
- 3154 B3
- 3155 B3
- 3156 B9
- 3157 C9
- 3158 B4
- 3159 A5
- 3160 B5
- 3161 C9
- 4180 B3
- 6161 C4
- 9152 D4
- 9175 C5
- 9180 E5
- 9181 B4
- F150 E5
- F151 E5
- F152 C5
- F153 B5
- F154 B8
- I152 E4
- I155 C4
- I157 B4
- I162 C8
- I163 C9
- I166 B8
- I168 B9
- I169 C9
- I170 B11
- I171 C11
- SG01 B4
- SG02 C4
- SG03 E4
- SG04 D4
- SG08 C5
- SG09 C5
- SG10 C5
- SG11 C5

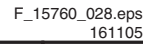
SIDE CINCH		
ITEM	Mono Set	Stereo Set
0250	---	YES
0277	YES	---
2172	---	330p
3152	---	47K
3153	---	150R

SIDE HEADPHONE		
ITEM	HP NA/LA/AP	HP EU
3156	120R	270R
3157	120R	270R

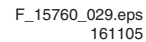
3139 123 5718.1

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161105

1232	A4	1252	A1	1278	A4	2172	A2	2175	A2	3151	A2	3154	A1	3157	A4	3160	A1	9175	A2
1250	A3	1254	A3	1279	A4	2173	A3	2180	A1	3152	A3	3155	A1	3158	A1	6161	A1	9180	A1
1251	A2	1277	A2	2171	A1	2174	A2	3150	A2	3153	A3	3156	A4	3159	A1	9152	A3	9181	A1

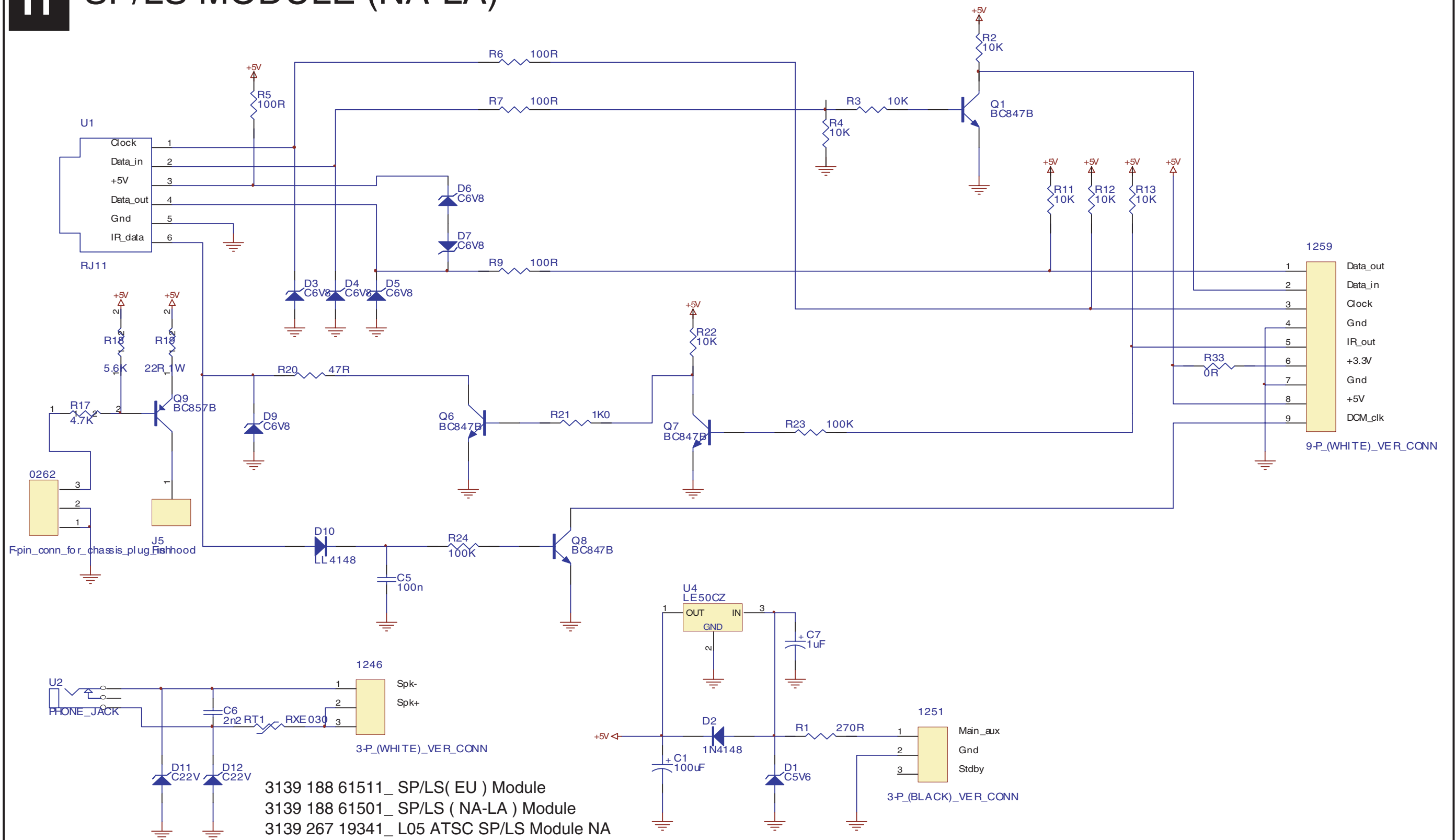


2176 A1	2178 A1	2181 A2	3161 A2	4180 A3
---------	---------	---------	---------	---------

[illegible]

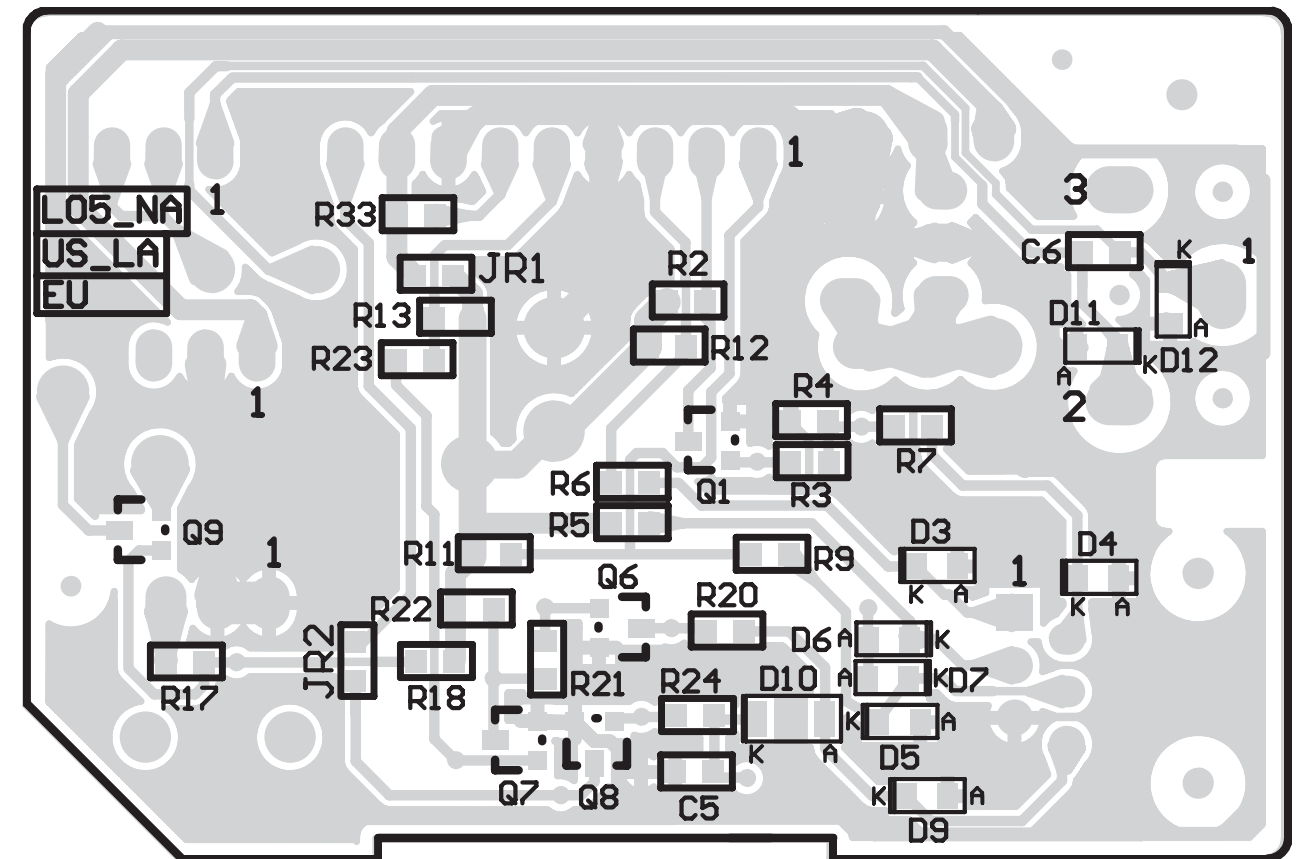
SP/LS Module (NA-LA)

I1 SP/LS MODULE (NA-LA)



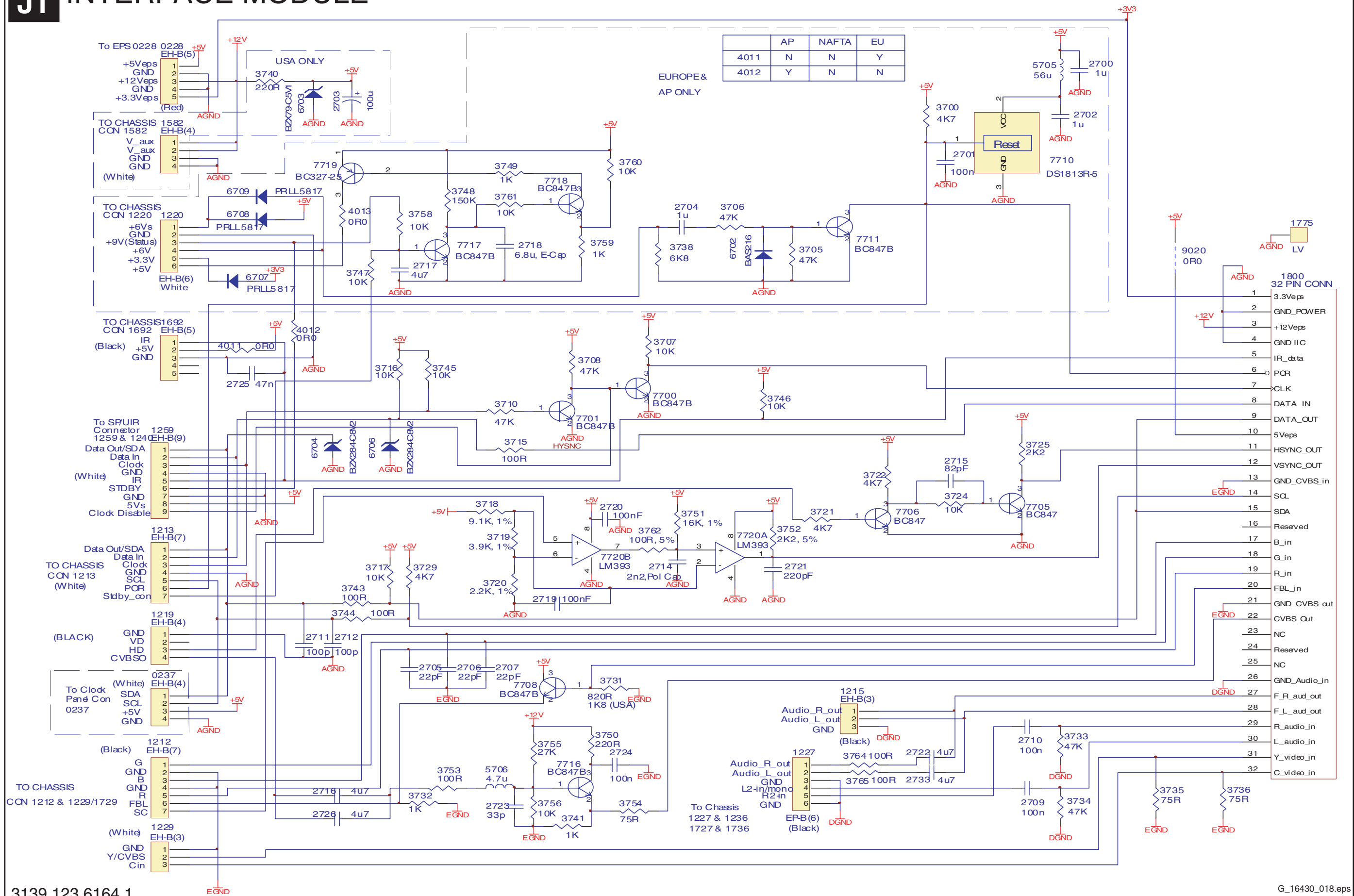
3139 188 61511_ SP/LS(EU) Module
 3139 188 61501_ SP/LS (NA-LA) Module
 3139 267 19341_ L05 ATSC SP/LS Module NA

Layout SP/LS Module (NA-LA) (Bottom Side)



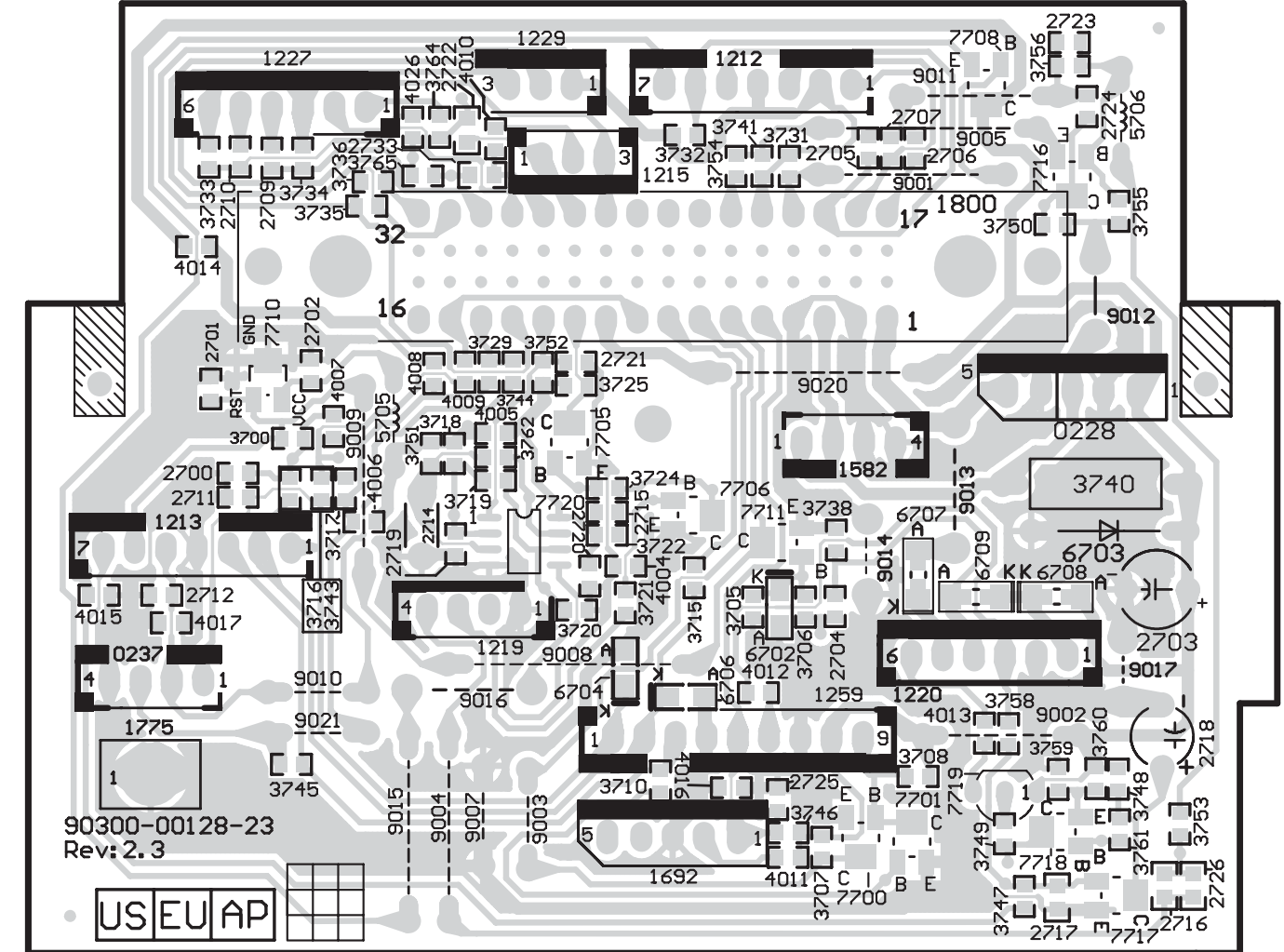
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Interface Module

J1 INTERFACE MODULE

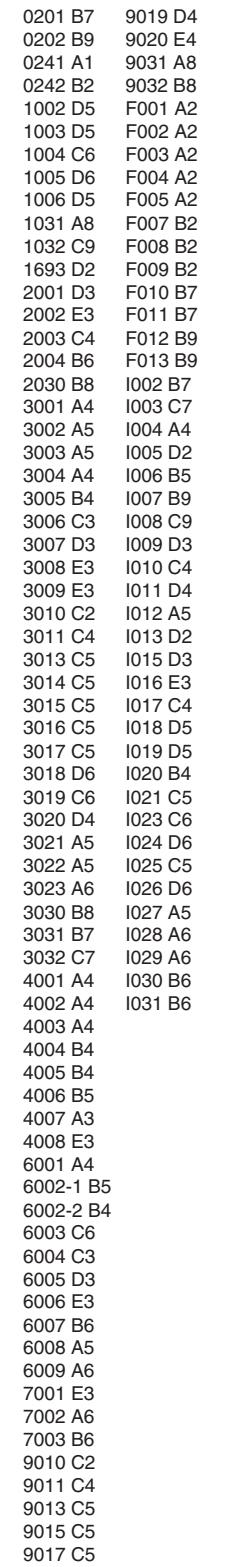
3139 123 6164.1

G_16430_018.eps
040506

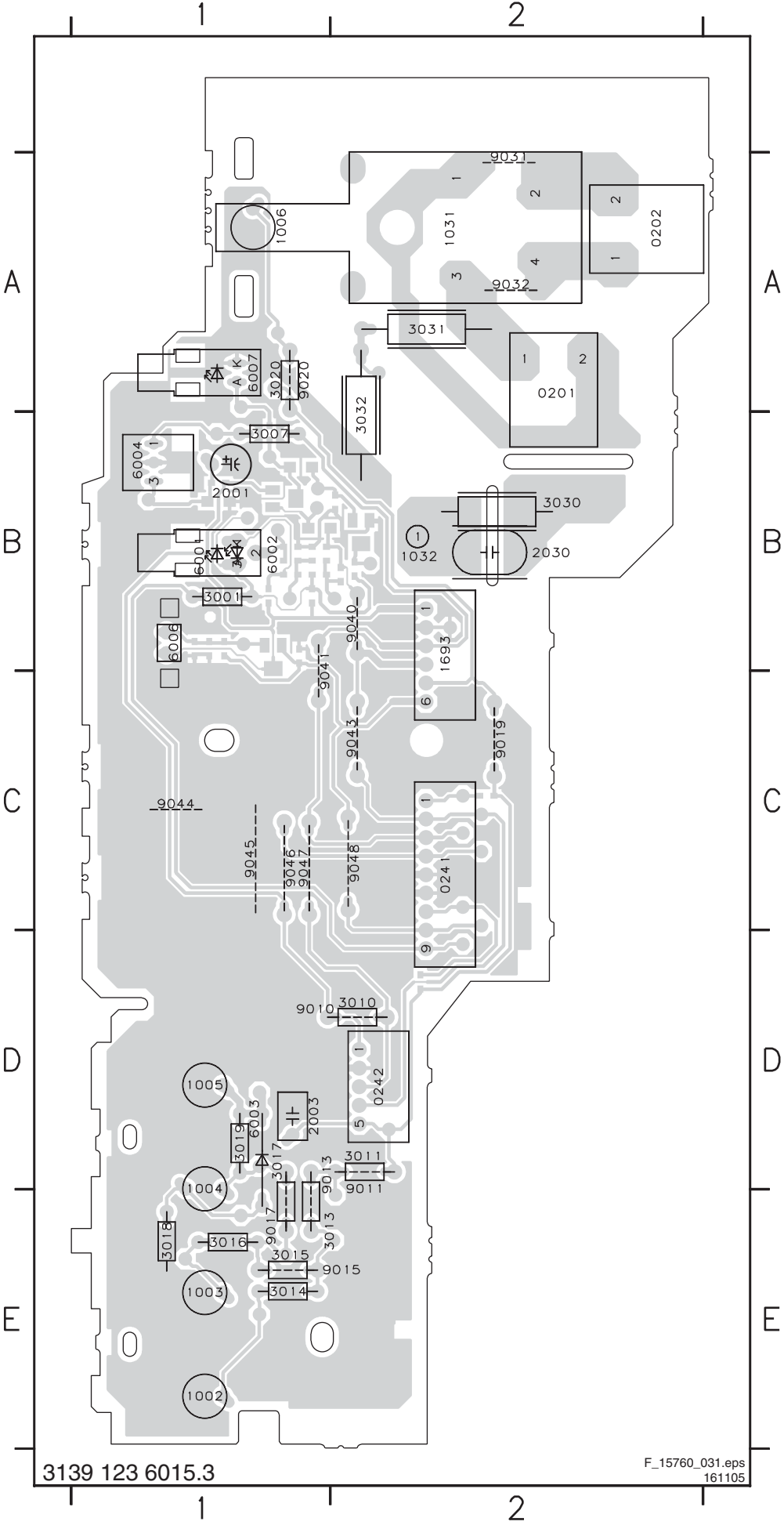


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050506

MAINS SWITCH PANEL(SL5)

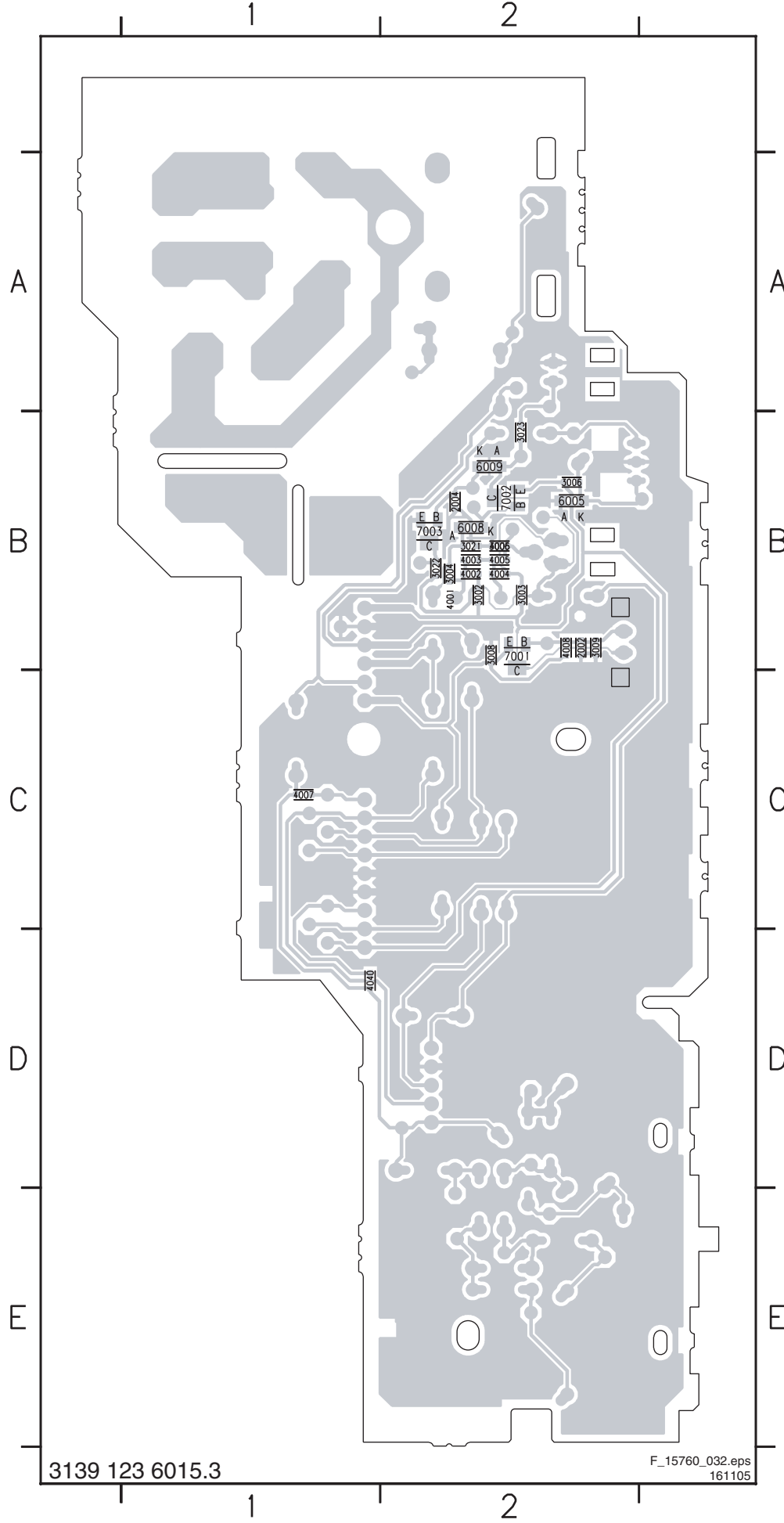


Layout Main Switch Panel (For SL5 Styling) (Top Side)



- 0201 A2
- 0202 A2
- 0241 C2
- 0242 D2
- 1002 E1
- 1003 E1
- 1004 D1
- 1005 D1
- 1006 A1
- 1031 A2
- 1032 B2
- 1693 B2
- 2001 B1
- 2003 D1
- 2030 B2
- 3001 B1
- 3007 B1
- 3010 D2
- 3011 D2
- 3013 E1
- 3014 E1
- 3015 E1
- 3016 E1
- 3017 D1
- 3018 E1
- 3019 D1
- 3020 A1
- 3030 B2
- 3031 A2
- 3032 B2
- 6001 B1
- 6002 B1
- 6003 D1
- 6004 B1
- 6006 B1
- 6007 A1
- 9010 D1
- 9011 D2
- 9013 D1
- 9015 E2
- 9017 E1
- 9019 C2
- 9020 A1
- 9031 A2
- 9032 A2
- 9040 B2
- 9041 C1
- 9043 C2
- 9044 C1
- 9045 C1
- 9046 C1
- 9047 C1
- 9048 C2

Layout Main Switch Panel (For SL5 Styling) (Bottom Side)



- 2002 B2
- 2004 B2
- 3002 B2
- 3003 B2
- 3004 B2
- 3005 B2
- 3006 B2
- 3008 B2
- 3009 B2
- 3021 B2
- 3022 B2
- 3023 B2
- 4001 B2
- 4002 B2
- 4003 B2
- 4004 B2
- 4005 B2
- 4006 B2
- 4007 C1
- 4008 B2
- 4040 D1
- 6005 B2
- 6008 B2
- 6009 B2
- 7001 B2
- 7002 B2
- 7003 B2

8. Alignments

Index of this chapter:

- 8.1 General Alignment Conditions
- 8.2 Hardware Alignments
- 8.3 Software Alignments and Settings

Notes:

- The Service Default Mode (SDM) and Service Alignment Mode (SAM) are described in chapter 5. Menu navigation is done with the CURSOR UP, DOWN, LEFT or RIGHT keys of the remote control transmitter.
- Figures below can deviate slightly from the actual situation, due to different set executions.

8.1 General Alignment Conditions

8.1.1 Start Conditions

Perform all electrical adjustments under the following conditions:

- Power supply voltage (depends on region):
 - AP-NTSC: 120 V_{AC} or 230 V_{AC} / 50 Hz (± 10%).
 - AP-PAL-multi: 120 - 230 V_{AC} / 50 Hz (± 10%).
 - EU: 230 V_{AC} / 50 Hz (± 10%).
 - LATAM-NTSC: 120 - 230 V_{AC} / 50 Hz (± 10%).
 - US: 120 V_{AC} / 60 Hz (± 10%).
 - Connect the set to the AC Power via an isolation transformer with low internal resistance.
 - Allow the set to warm up for approximately 15 minutes.
 - Measure voltages and waveforms in relation to chassis ground (with the exception of the voltages on the primary side of the power supply).
- Caution:** It is not allowed to use heatsinks as ground.
- Test probe: R_i > 10 Mohm, C_i < 20 pF.
 - Use an isolated trimmer/screwdriver to perform alignments.

8.2 Hardware Alignments

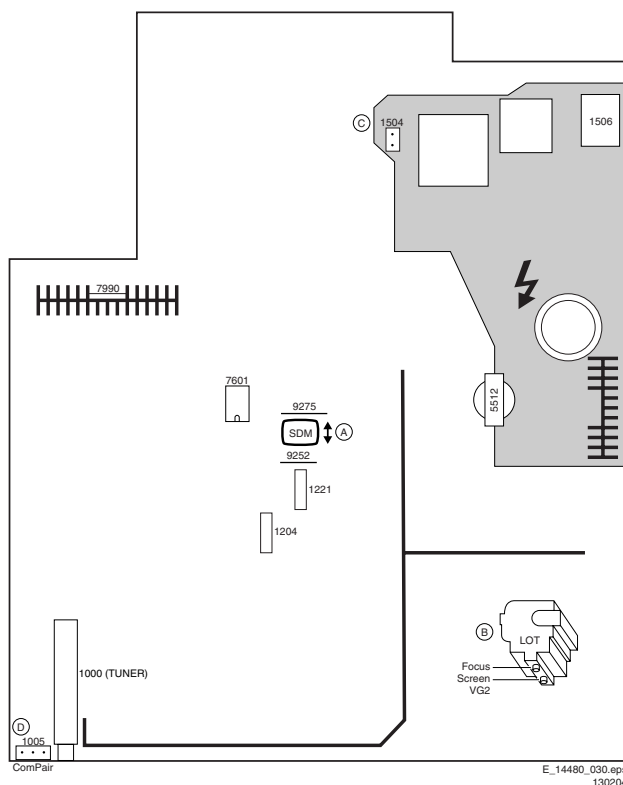


Figure 8-1 Top view family board

8.2.1 Vg2 Adjustment

1. Activate the SAM.
 2. Go to the WHITE TONE sub menu.
 3. Set the values of NORMAL RED, GREEN, and BLUE to "32".
 4. Go, via the MENU key, to the normal user menu and set
 5. SATURATION/COLOR to "0".
 6. CONTRAST to "0".
 7. BRIGHTNESS to minimum (OSD just visible).
 8. Return to the SAM via the MENU key.
 9. Connect the RF output of a pattern generator to the antenna input. Test pattern is a 'black' picture (blank screen on CRT without any OSD info) with a signal strength of 1 V_{pp}.
 10. Connect the 10:1 probe to the positive side of the vertical deflection (positive flyback pulse). Ground the scope at the CRT-panel. Trigger the scope on the vertical pulse.
 11. Measure with a 100:1 probe (R_i > 10 Mohm, C_i < 3.5 pF) at the cathodes of the picture tube socket (pin 8 - RED, pin 6 - GREEN and pin 11 - BLUE). Measure the level of the black current measuring pulses. These are the 2nd line (Red), 3rd line (Green), and 4th line (Blue) directly after the frame blanking.
- Remark:** This chassis is using a TDA110xx (Hercules) series. There are two different measuring pulses at each of the R, G, and B cathodes. The above-mentioned level applies to the lower pulse (which is the nearer one to the ground) of the gun with highest cut-off voltage.
12. Select the cathode with the highest V_{dc} value for the alignment. Adjust the V_{cutoff} of this gun with the SCREEN potentiometer (see figure "Top view family board") on the LOT to the 160V.
 13. Restore BRIGHTNESS and CONTRAST to normal (= 31).

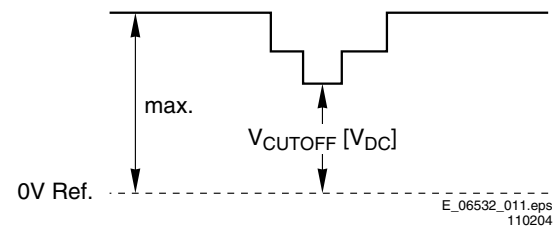
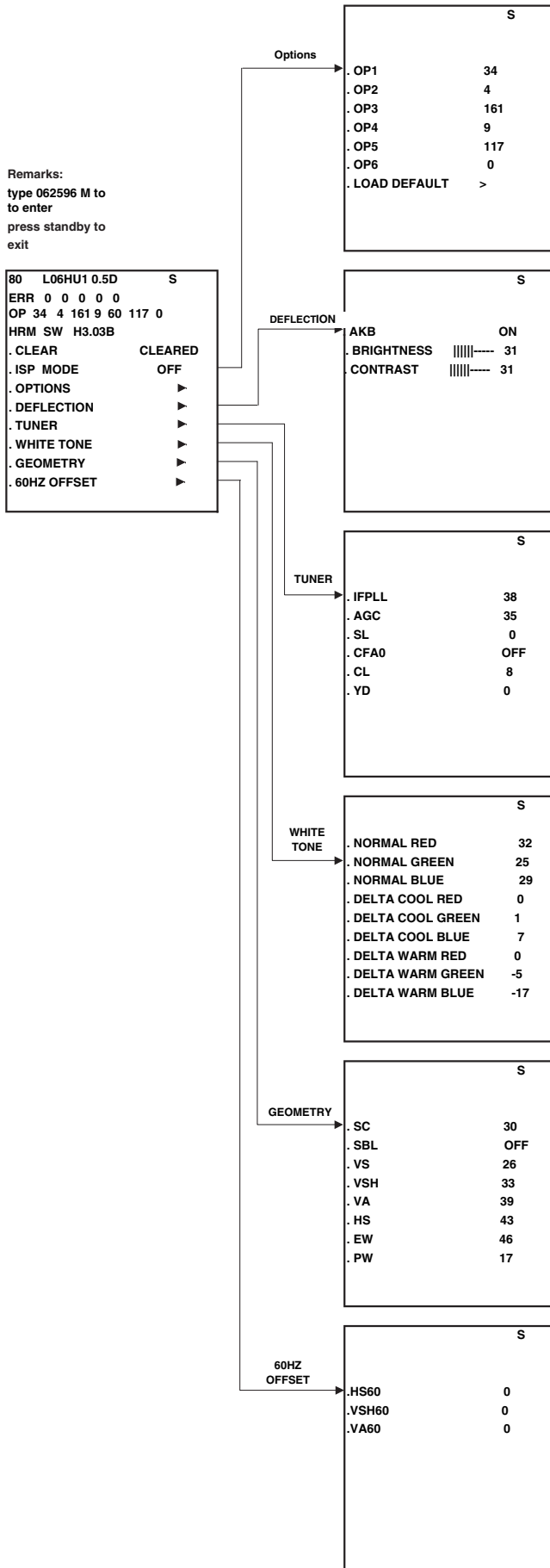


Figure 8-2 V_{cutoff} waveform

8.2.2 Focusing

1. Tune the set to a circle or crosshatch test pattern (use an external video pattern generator).
2. Choose picture mode NATURAL (or MOVIES) with the SMART PICTURE button on the remote control transmitter.
3. Adjust the FOCUS potentiometer (see figure "Top view family board") until the vertical lines at 2/3 from east and west, at the height of the center line, are of minimum width without visible haze. Also the vertical lines may not be too wide compared to the central lines in the picture. Check this for both cross-hatch and circle pattern.

8.3 Software Alignments and Settings



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260406

Figure 8-3 Service Mode overview (Analog TV mode)

Enter the Service Alignment Mode (see also chapter 5 “Service Modes, ...”). The SAM menu will now appear on the screen.

Select one of the following alignments:

- Options
- Tuner
- White Tone
- Geometry
- Audio

8.3.1 Options

Options are used to control the presence/absence of certain features and hardware.

How to change an Option Byte

An Option Byte represents a number of different options. Changing these bytes directly, makes it possible to set all options very fast. All options are controlled via seven option bytes. Select the option byte (OP1.. OP7) with the MENU UP/DOWN keys, and enter the new value.

Leaving the OPTION submenu saves the changes in the Option Byte settings. Some changes will only take effect after the set has been switched “off” and “on” with the AC power switch (cold start).

How to calculate the value of an Option Byte

Calculate an Option Byte value (OP1 .. OP7) in the following way:

- Check the status of the single option bits (OB): are they enabled (1) or disabled (0).
- When an option bit is enabled (1) it represents a certain value (see column “Bit value” in table below). When an option bit is disabled, its value is 0.
- The total value of an Option Byte (decimal) is formed by the sum of its eight option bits. The factory values are printed on a sticker on the CRT.

Table 8-1 Option Byte calculation

Bit (value)	OP1	OP2	OP3	OP4	OP5	OP6	OP7
0 (1)	OB10	OB20	OB30	OB40	OB50	OB60	OB70
1 (2)	OB11	OB21	OB31	OB41	OB51	OB61	OB71
2 (4)	OB12	OB22	OB32	OB42	OB52	OB62	OB72
3 (8)	OB13	OB23	OB33	OB43	OB53	OB63	OB73
4 (16)	OB14	OB24	OB34	OB44	OB54	OB64	OB74
5 (32)	OB15	OB25	OB35	OB45	OB55	OB65	OB75
6 (64)	OB16	OB26	OB36	OB46	OB56	OB66	OB76
7 (128)	OB17	OB27	OB37	OB47	OB57	OB67	OB77
Total:	Sum	Sum	Sum	Sum	Sum	Sum	Sum

Option Bit Assignment

Table 8-2 Option code overview per model

Byte	Bit	Option	Model	
			27HT4000D/27	27HT7210D/27
Byte_0 (TV System)	7	Not Used	0	0
	6		0	0
	5	Default sound	1	1
	4	BG (or WEST EU)-001, I (or UK)-010	0	0
	3	DK (or EAST EU)-011, M-100, LL (or FRANCE)-101	0	0
	2	Sound Board	0	0
	1	Mono-000, Multi Stereo-001	1	1
	0	BTSC Stereo-010, AVStereo-011	0	0
Decimal (visible in Options menu)			34	34
Hex			22	22
Byte_1 (Pin Usage)	7	Not Used	0	0
	6	WideScreen	0	0
	5	Rotation	0	0
	4	QSS	0	0
	3	Uir Msg	0	0
	2	SPI I2C	0	1
	1	Not Used	0	0
	0		0	0
Decimal (visible in Options menu)			0	4
Hex			00	04
Byte_2 (Devices)	7	SCAVEM	1	1
	6	Comb Filter	0	0
	5	EW	0	1
	4	OSD FRONT	0	0
	3	Radio	0	0
	2	LNA	0	0
	1	Tuner	0	0
	0	None-00, Philips-01, Alps-10	1	1
Decimal (visible in Options menu)			129	161
Hex			81	A1
Byte_3 (Devices)	7	Not Used	0	0
	6	Soft Clipper	0	0
	5	Not Used	0	0
	4		0	0
	3	SmartPort	0	1
	2	Active-Off LED	0	0
	1	WSL	0	0
	0	None-00, 4136-01, 34836-10	1	1
Decimal (visible in Options menu)			1	9
Hex			01	09
Byte_4 (AV, Tuning)	7	Not Used	0	0
	6	AV3YC	0	0
	5	CVI	1	1
	4	AV2YC	1	1
	3	AV3	1	1
	2	AV2	1	1
	1	AV1	1	0
	0	RGB	0	0
Decimal (visible in Options menu)			62	60
Hex			3E	3C

Byte	Bit	Option	Model	
Byte_5 (Feature)	7	ITV Ring	0	0
	6	Protection	1	1
	5	WatchDog	1	1
	4	No Ident Standby	1	1
	3	Buzzer Type	0	0
	2	None=00, Internal=01, External=10	1	1
	1	Clock Type	0	0
	0	None-00, OSD-01, LED-10	1	1
Decimal (visible in Options menu)			117	117
Hex			75	75
Byte_6 (Power)	7	Not Used	0	0
	6		0	0
	5		0	0
	4		0	0
	3		0	0
	2		0	0
	1	Card POR	0	0
	0		0	0
Decimal (visible in Options menu)			0	0
Hex			00	00

8.3.2 Tuner

Note: Described alignments are only necessary when the NVM (item 7601) is replaced.

IF PLL

This adjustment is auto-aligned. Therefore, no action is required.

AGC (AGC take over point)

1. Set the external pattern generator to a color bar video signal and connect the RF output to aerial input. Set amplitude to 10 mV and set frequency to 61.25 MHz (channel 3).
2. Connect a DC multimeter to pin 1 of the tuner (item 1000 on the main panel).
3. Activate the SAM.
4. Go to the TUNER sub menu.
5. Select AGC with the UP/DOWN cursor keys.
6. Adjust the AGC-value (default value is 27) with the LEFT/RIGHT cursor keys until the voltage at pin 1 of the tuner lies between 3.8 and 2.3 V (default value is "20").
7. Switch the set to STANDBY, in order to store the alignments.

CL (Cathode drive level)

Always set to "5".

8.3.3 White Tone

In the WHITE TONE sub menu, the values of the black cut off level can be adjusted. Normally, no alignment is needed, and you can use the given default values.

The color temperature mode (NORMAL, COOL and WARM) and the color (R, G, and B) can be selected with the UP/DOWN RIGHT/LEFT cursor keys. The value can be changed with the LEFT/RIGHT cursor keys. First, select the values for the NORMAL color temperature. Then select the values for the COOL and WARM mode. After alignment, switch the set to STANDBY, in order to store the alignments.

Default settings: See table "NVM Default values" in chapter 5 "Service Modes,".

8.3.4 Geometry

The geometry alignments menu contains several items to align the set, in order to obtain correct picture geometry.

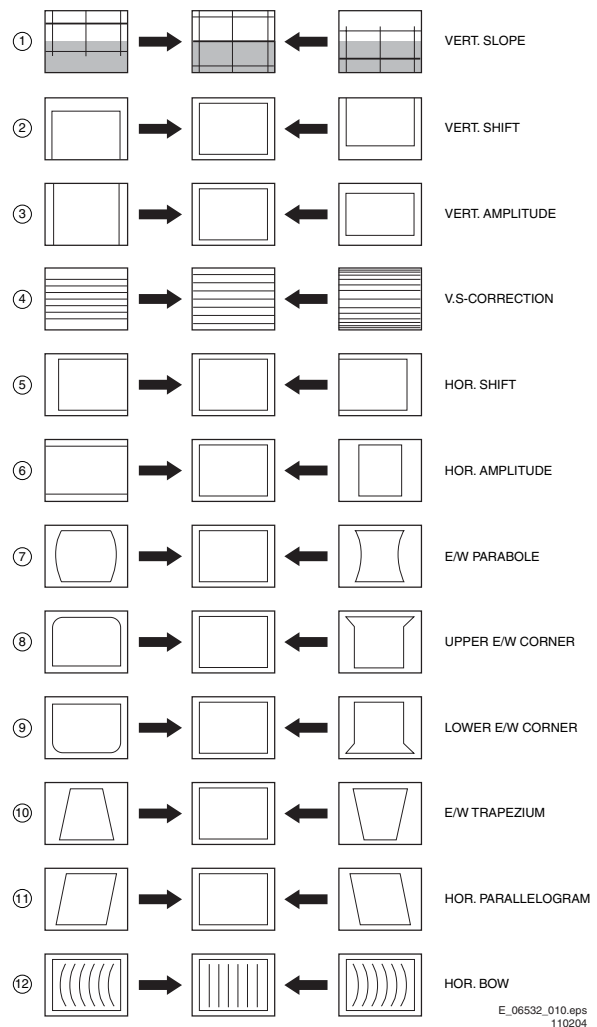


Figure 8-4 Geometry alignments

1. Connect an external video pattern generator to the aerial input of the TV-set and input a crosshatch test pattern. Set the generator amplitude to at least 1 mV and set frequency to 61.25 MHz (channel 3).
2. Set 'Smart Picture' to NATURAL (or MOVIES).
3. Activate the SAM menu (see chapter 5 "Service Modes, ...").
4. Go to the GEOMETRY sub menu.
5. Choose HORIZONTAL or VERTICAL alignment

Now the following alignments can be performed:

Horizontal

- **Horizontal Parallelogram (HP).** Align straight vertical lines in the top and the bottom; vertical rotation around the center.
- **Horizontal Bow (HB).** Align straight horizontal lines in the top and the bottom; horizontal rotation around the center.
- **Horizontal Shift (HS).** Align the horizontal center of the picture to the horizontal center of the CRT.
- **East West Width (EW).** Align the picture width until the complete test pattern is visible.
- **East West Parabola (PW).** Align straight vertical lines at the sides of the screen.
- **Upper Corner Parabola (UCP).** Align straight vertical lines in the upper corners of the screen.
- **Lower Corner Parabola (LCP).** Align straight vertical lines in the lower corners of the screen.
- **East West Trapezium (TC).** Align straight vertical lines in the middle of the screen.
- **H60 (Delta HSH for 60Hz, if present).** Align straight horizontal lines if NTSC system is used (60 Hz) i.s.o. PAL (50 Hz). Default value is "9".

Vertical

- **Service blanking (SBL).** Switch the blanking of the lower half of the screen "on" or "off" (to be used in combination with the vertical slope alignment).
- **Vertical Shift (VSH).** Align the vertical centering so that the test pattern is located vertically in the middle. Repeat the 'vertical amplitude' alignment if necessary.
- **Vertical slope (VS).** Align the vertical center of the picture to the vertical center of the CRT. This is the first of the vertical alignments to perform. For an easy alignment, set SBL to "on".
- **Vertical Amplitude (VA).** Align the vertical amplitude so that the complete test pattern is visible.
- **Vertical S-Correction (SC).** Align the vertical linearity, meaning that vertical intervals of a grid pattern must be equal over the entire screen height.
- **Vertical Zoom (VX, if present).** The vertical zoom is added in for the purpose of development. It helps the designer to set proper values for the movie expand or movie(16x9) compress. Default value is "25".
- **V60 (Delta VAM for 60Hz, if present).** Align straight vertical lines if NTSC system (60 Hz) is used i.s.o. PAL (50 Hz). Default value is "-2".

In the table "NVM Default values" in chapter 5 "Service Modes,", you will find the GEOMETRY default values for the different sets.

8.3.5 Audio

No alignments are needed for the audio sub menu. Use the given default values.

QSS (Quasi Split Sound)

- For NICAM/2CS sound system (EU/AP, except for AP-NTSC), set to "On".
- For AV-Stereo sound system (sets without NICAM), set to "On".
- For all other sets (NAFTA/LATAM/AP-NTSC), set to "Off".

FMI (Freq. Modulation Intercarrier)

- For NICAM/2CS sound system (EU/AP, except for AP-NTSC), set to "On".
- For AV-Stereo sound system (sets without NICAM), set to "Off".
- For dBx/non-dBx sound systems, set to "On",

9. Circuit Descriptions, List of Abbreviations, and IC Data Sheets

Index of this chapter:

- 9.1 Introduction
- 9.2 ATSC Module
- 9.3 Supply Architecture
- 9.4 Power Modes
- 9.5 Abbreviation List
- 9.6 IC Data Sheets

Notes:

- Only **new** circuits compared to the L04 chassis are described in this chapter. For the other circuit descriptions, see the L04 manual.
- Figures can deviate slightly from the actual situation, due to different set executions.
- For a good understanding of the following circuit descriptions, please use the diagrams in sections “Block Diagrams, ...”, and/or “Electrical Diagrams”. Where necessary, you will find a separate drawing for clarification.

9.1 Introduction

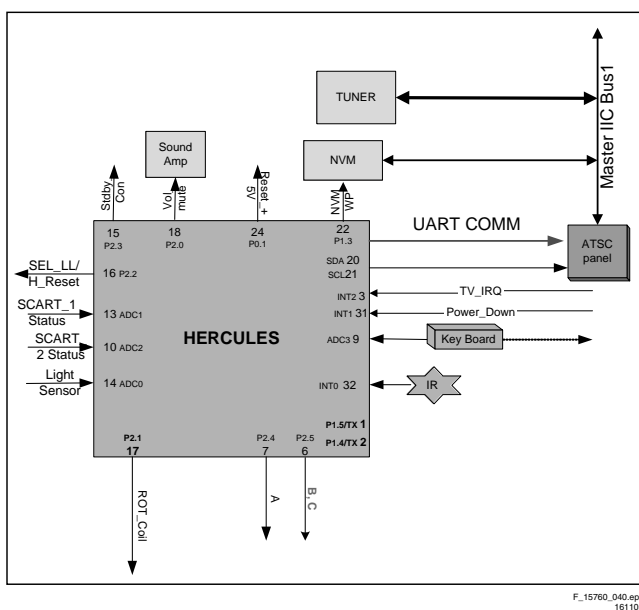


Figure 9-1 Chassis block diagram

The "L04.6 ATSC" platform is derived from the L04 chassis. It is designed to be a Standard Definition (SD) 60 Hz set for the NAFTA market segments. Screen sizes of standard TV models are 27- and 32-inch, but the iTV/Hotel TV version (L04.6HU CA) uses 27 inch screens only.

The "L04" chassis, developed by Philips Singapore BCT MTV, was a global "50/60Hz" chassis for the BASIC and BASIC+ market segment.

The fundamental electrical properties and key components of L04.6 ATSC are:

- Hercules = TDA12000 with integrated Video processing, Sound processing and Microprocessor.
- Audio Amplifier = TDA2616Q with the capability to drive up to 2X10W stereo sets.
- Zoran ZR39640: ATSC decoder + Scalar.
- The L04.6HU CA (iTV/Hotel TV), contains some additional modules: the EPS1B (power supply for extra functions), the SP/LS (Smart Plug and bathroom speaker), and an Interface module (not used in standard models).

The standard architecture consists of a Main panel (called "family board"), a Picture Tube panel, a Side I/O panel, a Top Control panel, and an ATSC panel. The Main panel carries the small and large signals on the same board, and uses primarily conventional components, with some surface mounted devices in the audio and video processing part.

The ATSC digital module is a TV bolt on module with a terrestrial RF Digital ATSC 8VSB (Free to Air) front end and Cable RF Digital ATSC, QAM (Cable in-the-clear) front end. For Service, this is a black box. When defective, this module must be replaced, and the defective module must be send to the centralized repair workshop.

The functions for video/audio processing, microprocessor (uP), and CC/Teletext (TXT) decoding are all combined in one IC (TDA120xxH, item 7200), the so-called third generation Ultimate One Chip (UOC-III) or "Hercules". This chip is mounted on the "solder" side of the main panel, and has the following features:

- Control, small signal, mono/stereo, and extensive Audio/ Video switching in one IC.
- Upgrade with digital sound & video processing.
- Alignment free IF.
- FM sound 4.5/5.5/6.0/6.5, no traps/bandpass filters.
- Full multi-standard color decoder.
- One Xtal reference for all functions (microprocessor, RCP, TXT/CC, RDS, color decoder, and stereo sound processor).

The tuning system features 181 channels with on-screen display. The main tuning system uses a tuner, a microcomputer, and a memory IC mounted on the main panel. The microcomputer communicates with the memory IC, the customer keyboard, remote receiver, tuner, signal processor IC and the audio output IC via the I2C bus. The memory IC retains

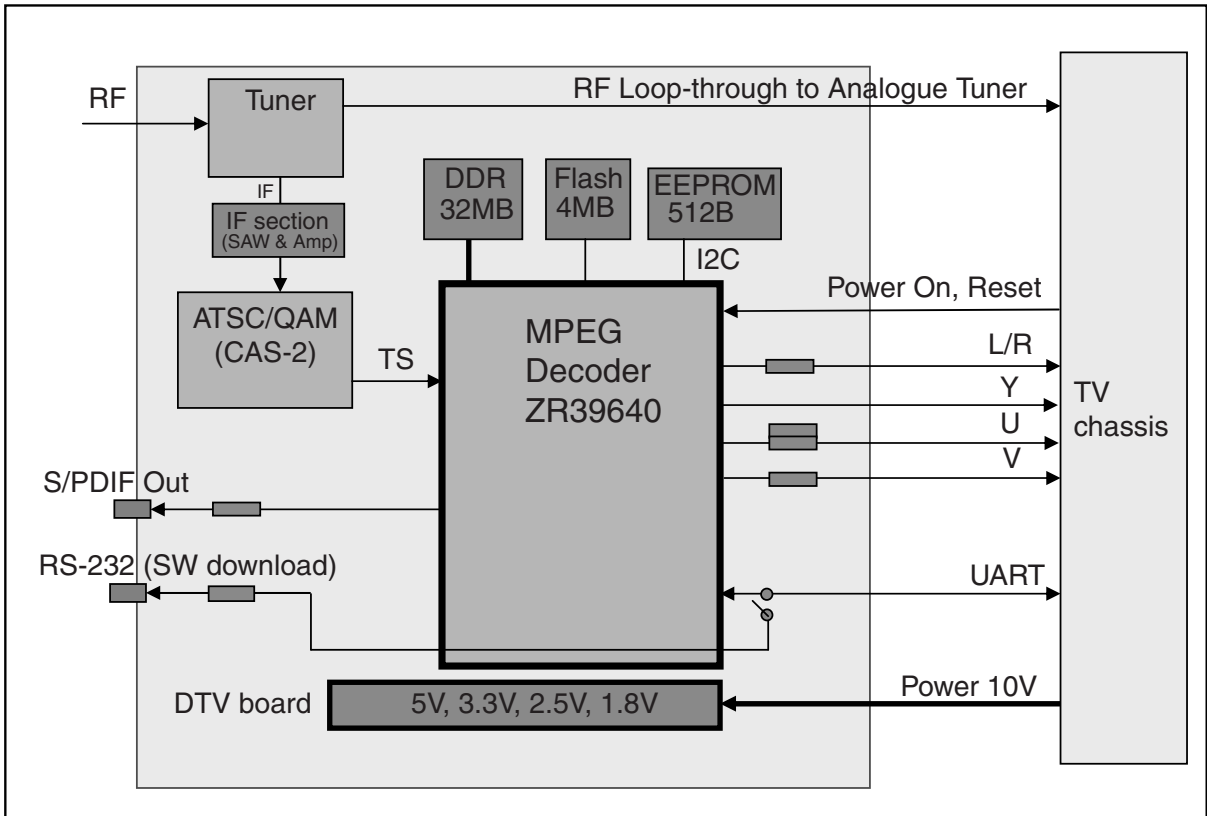
the settings for favorite stations, customer-preferred settings, and service / factory data.
The on-screen graphics and closed caption decoding are done within the microprocessor where they are added to the main signal.

The chassis uses a Switching Mode Power Supply (SMPS) for the main voltage source. The chassis has a 'hot' ground reference on the primary side and a cold ground reference on

the secondary side of the power supply and the rest of the chassis.

9.2 ATSC Module

9.2.1 Block Diagram



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141105

Figure 9-2 Block diagram ATSC module

The module functionality includes digital cable and terrestrial reception and processing, digital terrestrial (8VSB ATSC) and digital cable (QAM & 8VSB ATSC) free to air reception and processing, and S/PDIF audio output possibility (coaxial). The ATSC module provides its own OSD (On Screen Display) capsulated in the main video output and handles EPG (digital, based on PSIP information), CC (digital) and V-Chip (digital). The module can be controlled via RS-232C by a host controller. The ATSC module has one physical RF input for cable or terrestrial. The CAS-2 IC sends the serial Transport Stream to the MPEG-2 decoder after demodulation of the digital 8-VSB ATSC RF (Terrestrial or Cable) and 64-256 QAM (Cable in-the-clear). The MPEG2 Transport Stream is routed to the ZR39640 IC where it is parsed into video, audio, and data streams. After the video stream decoding, processing, and conversion, the video is coming out of the module on the main video output (480i, analogue YUV). The audio stream is decoded, processed, and DA converted, and is coming out of the module on the audio output (analogue L/R, standard or Dolby-ProLogic down-mixed – and S/PDIF).

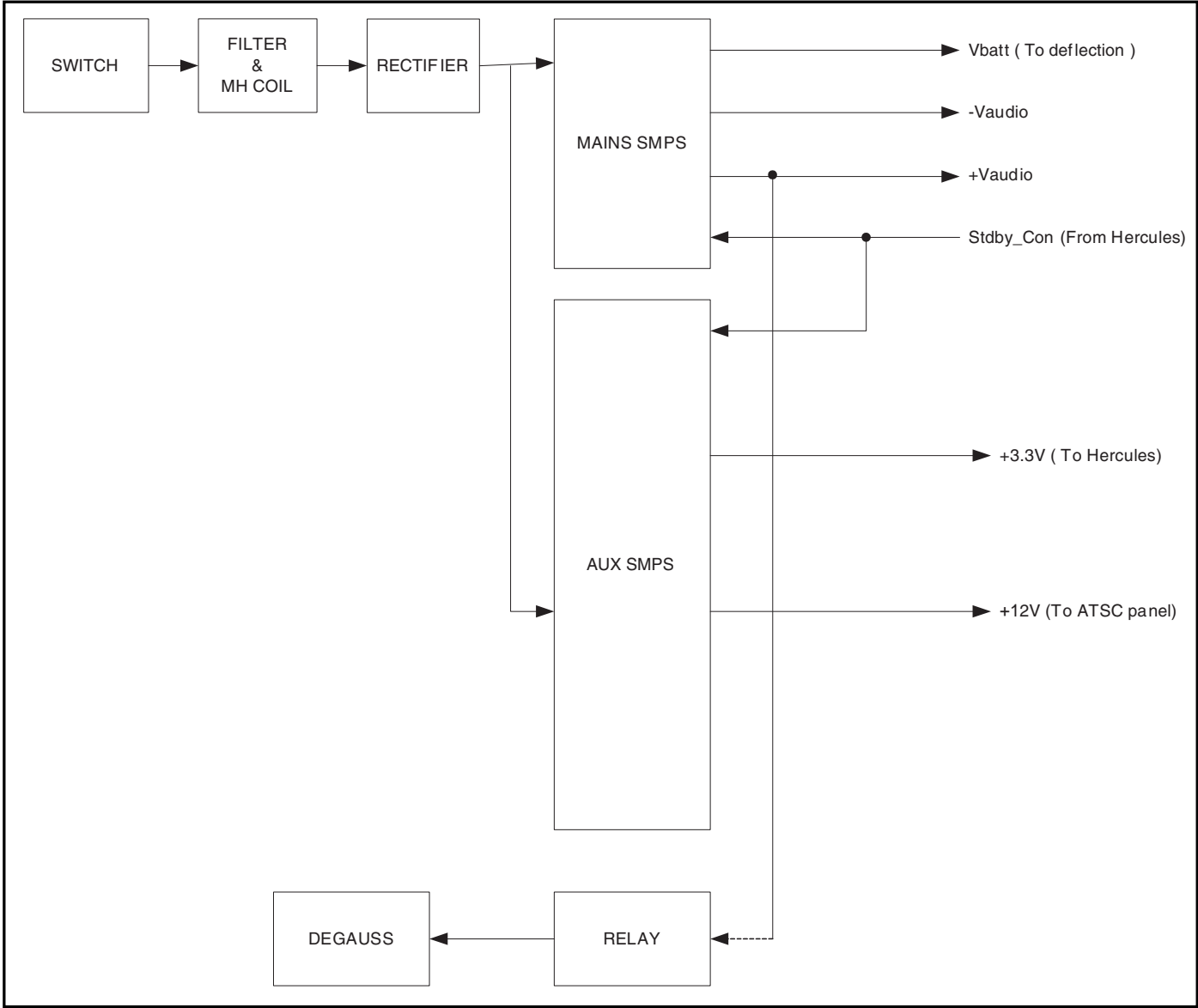
Table 9-1 ATSC module connector pinning overview

Pin No	Signal Name	Name Explanation
Connector P1206		
1	Rx	RS-232 Rx
2	GND	GND
3	Tx	RS-232 Tx
4	RESET#	Module Reset Signal
Connector P1212		
1	Y	Video Y signal out to TV chassis
2	GND	GND
3	U	Video U signal Out to TV chassis
4	GND	GND
5	V	Video V signal Out to TV chassis
Connector P1219		
1	R_OUT	Audio Right signal out to TV chassis
2	GND	GND
3	L_OUT	Audio Left signal out to TV chassis
4	GND	GND
5	Reserved	Reserved
Connector P1582		
1	10V	Supply
2	10V	Supply
3	GND	GND
4	GND	GND

Connector P701		
1	Tx	3.3V TTL (RS232 Tx for Service port)
2	GND	GND
3	Rx	3.3V TTL (RS232 Rx for Service port)

9.3 Supply Architecture

9.3.1 Block Diagram



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161105

Figure 9-3 Block diagram Power Supply

The L04.6 power management consists of two Switched Mode Power Supplies (SMPS).

The Main SMPS delivers Vbat and Vaudio. The Aux SMPS delivers 3.3V, 12V to derive Hercules and Tuner on the main chassis, and also to provide the 3.3V, 6V and 10V supply to the ATSC Module The Aux SMPS also gives out the POWER_DOWN signal to the Hercules. This is an early warning signal on power failure used to mute the sound and EHT discharge.

The Hercules gives out STDBY_CON signal to the Main SMPS. This is to enable the Main SMPS in normal operation,

and disable it during Stand-by. Figure above gives the block diagram of the complete chassis power supply.

STBY_CON
This signal is generated by the Hercules. It is logic “Low” (0V) under normal operation and in Semi Stand-by of the TV, and High (3.3V) during Stand-by.

POWER_DOWN
This signal is generated by the Aux SMPS. It is logic “High” (3V3) under normal operation of the TV and goes “Low” (0V) when the AC Power input voltage of the supply goes below 70 V_{AC}.

B (Hercules Port)

This port is used to switch "on" the +12V of the ATSC panel. It is logic "High" (3.3V) under normal operation and in Semi Stand-by of the TV, and "Low" (0V) during Standby.

9.4 Power Modes

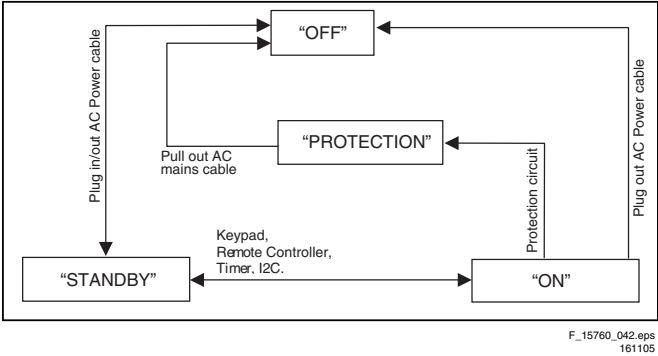


Figure 9-4 Power modes transition diagram

The chassis has four power supply modes for efficient power management and protection management. They are: "ON", "OFF", "STANDBY", and "PROTECTION". Transitions between any power modes are shown in figure above.

9.4.1 OFF Mode

The set is completely switched "off" from the AC Power. This is done with the AC. For NAFTA it means disconnecting the TV from the mains by pulling out the AC Power cable. When the mains is connected, this mode transits to "STANDBY". The transition timing for a "cold" start from "OFF" state to "ON" is such that from the instance the Hercules gets a hard reset, in 12 s or less, the audio and video must be present.

9.4.2 ON Mode

This is the normal operating mode. All the power supply lines in the chassis are available. All the circuits in the set are active. From this mode, it is possible to transit to "STANDBY", "PROTECTION", or "OFF" mode.

9.4.3 STANDBY Mode

The total power consumption of the TV set in this mode shall be equal or less than 1 W ("GREEN" requirement). The Standby State will be indicated by the LED (LED "off"). In this state, only the Hercules uP and NVM are powered. Rest of the chassis sub-systems are disconnected. Control ports STDBY_CON and AUX_ON are defined to control this status. In this mode, the Hercules and peripherals are set to the lowest power consumption mode (SLEEP MODE) by software. From this mode it shall be possible to transit to "ON" or "OFF" mode.

9.4.4 PROTECTION Mode

The power profile for the PROTECTION mode is as low as required to allow "soft" diagnostics, error detection, and to indicate LED flashes to flag the type of fault. The horizontal deflection is "off" in this mode. From the protection mode the only possible transition is to "OFF" mode and "ON" mode. Special cases to disable

9.5 Abbreviation List

2CS	2 Carrier (or Channel) Stereo
ACI	Automatic Channel Installation: algorithm that installs TV sets directly from cable network by means of a predefined TXT page
ADC	Analogue to Digital Converter
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency
AFT	Automatic Fine Tuning
AGC	Automatic Gain Control: algorithm that controls the video input of the feature box
AM	Amplitude Modulation
AP	Asia Pacific region
AR	Aspect Ratio: 4 by 3 or 16 by 9
ATS	Automatic Tuning System
AV	External Audio Video
AVL	Automatic Volume Leveler
BCL	Beam Current Limitation
B/G	Monochrome TV system. Sound carrier distance is 5.5 MHz
BTSC	Broadcast Television Standard Committee. Multiplex FM stereo sound system, originating from the USA and used e.g. in LATAM and AP-NTSC countries
CC	Closed Caption
CCC	Continuous Cathode Calibration
ComPair	Computer aided rePair
CRT	Cathode Ray Tube or picture tube
CSM	Customer Service Mode
CTI	Color Transient Improvement: manipulates steepness of chroma transients
CVBS	Composite Video Blanking and Synchronization
CVI	Component Video Input
DAC	Digital to Analogue Converter
DBX	Dynamic Bass Expander or noise reduction system in BTSC
D/K	Monochrome TV system. Sound carrier distance is 6.5 MHz
DFU	Direction For Use: description for the end user
DNR	Dynamic Noise Reduction
DSP	Digital Signal Processing
DST	Dealer Service Tool: special remote control designed for dealers to enter e.g. service mode
DVD	Digital Versatile Disc
EEPROM	Electrically Erasable and Programmable Read Only Memory
EHT	Extra High Tension
EHT-INFO	Extra High Tension information
EPG	Electronic Programming Guide
EU	Europe
EW	East West, related to horizontal deflection of the set
EXT	External (source), entering the set via SCART or Cinch
FBL	Fast Blanking: DC signal accompanying RGB signals
FILAMENT	Filament of CRT
FM	Field Memory or Frequency Modulation
H	Horizontal sync signal
HP	Headphone
I	Monochrome TV system. Sound carrier distance is 6.0 MHz
I2C	Integrated IC bus
IF	Intermediate Frequency

IIC	Integrated IC bus	POR	Power-On Reset
ITV	Institutional TV	PTP	Picture Tube Panel (or CRT-panel)
LATAM	Latin American countries like Brazil, Argentina, etc.	RAM	Random Access Memory
LED	Light Emitting Diode	RC	Remote Control handset
L/L'	Monochrome TV system. Sound carrier distance is 6.5 MHz. L' is Band I, L is all bands except for Band I	RGB	Red, Green, and Blue video signals
LS	Large Screen or Loudspeaker	ROM	Read Only Memory
M/N	Monochrome TV system. Sound carrier distance is 4.5 MHz	SDAM	Service Default / Alignment Mode
NC	Not Connected	SAP	Second Audio Program
NICAM	Near Instantaneous Compounded Audio Multiplexing. This is a digital sound system, mainly used in Europe.	SC	Sandcastle: pulse derived from sync signals
NTSC	National Television Standard Committee. Color system mainly used in North America and Japan. Color carrier NTSC M/N = 3.579545 MHz, NTSC 4.43 = 4.433619 MHz (this is a VCR norm, it is not transmitted off-air)	S/C	Short Circuit
NVM	Non Volatile Memory: IC containing TV related data e.g. alignments	SCL	Serial Clock
OB	Option Bit	SDA	Serial Data
OC	Open Circuit	SECAM	SEquence Couleur Avec Memoire. Color system mainly used in France and East Europe. Color carriers = 4.406250 MHz and 4.250000 MHz
OP	Option Byte	SIF	Sound Intermediate Frequency
OSD	On Screen Display	SS	Small Screen
PAL	Phase Alternating Line. Color system mainly used in West Europe (color carrier = 4.433619 MHz) and South America (color carrier PAL M = 3.575612 MHz and PAL N = 3.582056 MHz)	STBY	Standby
PCB	Printed Circuit board	SVHS	Super Video Home System
PLL	Phase Locked Loop. Used for e.g. FST tuning systems. The customer can give directly the desired frequency	SW	Software
		THD	Total Harmonic Distortion
		TXT	Teletext
		uP	Microprocessor
		UOC	Ultimate One Chip
		V	Vertical sync signal
		V_BAT	Main supply voltage for the deflection stage (mostly 141 V)
		V-chip	Violence Chip
		VCR	Video Cassette Recorder
		WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
		XTAL	Quartz crystal
		YC	Luminance (Y) and Chrominance (C) signal

9.6 IC Data Sheets

Not applicable

10. Spare Parts List

Not available at the time of publishing

11. Revision List

Manual xxxx xxx xxxx.0

- First release.